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FIELD NOTES RECORDED BY
NMFS FIELD PARTY LEADER
DURING DOLPHIN-SAFE CHARTER
ABOARD THE F/V *NICOLE K*
4 NOVEMBER 1992 - 7 DECEMBER 1992

By

Wesley A. Armstrong

ADMINISTRATIVE REPORT LJ-93-16

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LEADER DURING DOLPHIN-SAFE CHARTER ABOARD THE F/V NICOLE K
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Wesley A. Armstrong

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August, 1993



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CHARTER ABOARD THE F/V NICOLE K
4 NOVEMBER 1992 - 7 DECEMBER 1992.

Wesley A. Armstrong

Abstract

This report summarizes the operations of the National Marine Fisheries Service (NMFS) chartered tuna purse-seine vessel NICOLE K, and the daily research activities conducted by NMFS and Inter-American Tropical Tuna Commission (IATTC) scientists during Dolphin-Safe research. The primary function of the chartered vessel was to facilitate simultaneous tuna and dolphin tracking by locating, capturing, tagging, and releasing spotted dolphins and yellowfin tuna for subsequent tracking efforts by the National Oceanic and Atmospheric Administration (NOAA) Ship McARTHUR, and its auxiliary launches. The NICOLE K was equipped to support the tracking effort and assisted on two occasions. A total of six spotted dolphins were tagged and tracked during the study and timed-depth profiles were obtained from two of the tagged dolphins. Eighteen olive ridley sea turtles were captured, measured and tagged during the 30-day charter period. The report includes recommendations to assist with planning and execution of similar projects in the future.

Introduction

During 1992, NMFS' Southwest Fisheries Science Center (SWFSC) solicited a contract¹ for a U.S. flagged commercial tuna purse-seine vessel to conduct 30 days of fishing operations in support of Dolphin-Safe research. From November 4, 1992 through December 7, 1992, the Fishing Vessel NICOLE K in conjunction with the NOAA Ship McARTHUR,² participated in this research effort. The research was conducted in the eastern tropical Pacific Ocean³ (ETP). The primary objectives of the project were to capture, tag, and simultaneously track northern offshore spotted dolphins, *Stenella attenuata*, and yellowfin tuna, *Thunnus albacares*, in order to define the duration and dynamics of the tuna/dolphin bond, and to conduct food-habits studies to determine the degree to which the

¹NOAA Contract No. 50ABNA300010

²NOAA Cruise Number AR-92-04

³The region of the Pacific ocean bordered by Central America from 20°N to 15°S latitudes, and 160°W longitude.

bond is food-based.⁴ A secondary objective of the study was to determine whether the bond breaks or loosens at particular times or during particular conditions in order to determine whether tuna would be vulnerable to fishing at such times.⁵

Ancillary projects were performed by government scientists aboard the NICOLE K on an opportunistic basis to further investigate the mechanisms and nature of the tuna/dolphin association in order to make the most efficient use of this valuable research platform. Amendment (Section 110(a) November 23, 1988) of the reauthorization of the Marine Mammal Protection Act of 1972 focused on identifying promising new methods of locating and catching yellowfin tuna without incidental capture of dolphins.⁶ Understanding the mechanism of the tuna-dolphin bond is vitally important to achieving the goals of Section 110(a).

Three NMFS scientists (Wesley Armstrong, David Au, and Robert Pitman), and one IATTC scientist (Rick Lindsay) worked aboard the F/V NICOLE K during the 30-day charter period. Armstrong's primary duty as NMFS Field Party Leader aboard the tuna purse-seine vessel was to act as liaison between the vessel captain (fishing master), crew, and the scientific field parties on both vessels. All scientific personnel aboard the chartered tuna purse-seine vessel were responsible for assisting with tagging and tracking operations. Food habits studies, bird-flock behavioral observations, turtle research, and other ancillary projects were conducted on an opportunistic basis during non-tracking periods.

Thirty days of ship time were available aboard the NOAA Ship McARTHUR between 6 November - 5 December 1992. The NICOLE K was chartered by NOAA for 30 days commencing on 6 November, 1992. The area of capture operations encompassed (Figure 1):

7-12° N 77-55° W (the coastal Panamanian/Colombian boarder)⁷
5-00° N 81-00° W
5-00° N 115-00° W

⁴Scott, M.D., Preliminary Cruise Report: Tracking Study of Dolphins and Tuna. NOAA Cruise Number AR-92-04; Michael D. Scott, IATTC. P.O. Box 271, La Jolla, CA 92038. Unpub. ms. 1993.

⁵Demaster, D.P. 1992. Strategic Plan To Develop And Evaluate "Dolphin-Safe" Methods Of Fishing For Yellowfin Tuna In The Eastern Tropical Pacific, NMFS-SWFSC Admin. Rpt. LJ-92-16.

⁶Dolphins and the Tuna Industry. 1992. National Academy Press, Washington D.C. 176 p.

⁷Colombian scientific permit was obtained in case dolphins were tracked within their territorial waters.

16-00° N 115-00° W
11-00° N 94-00° W
14-42° N 92-00° W (the coastal Mexican/Guatemalan border and the Central American Pacific Ocean coastline from the Mexican/Guatemalan border to the Panamanian/Colombian border).

Two areas of ocean were targeted for research operations, based on historical weather data during the months of November and December in the ETP, NMFS/IATTC tuna vessel observer set records, and the sighting records from the Monitoring of Porpoise Stocks (MOPS) Marine Mammal sighting surveys 1986-1990.⁸ Scientific permits were obtained from Colombia, Costa Rica, El Salvador, France (Clipperton Island), Guatemala, Honduras, Nicaragua, Panama, and the United States. The scientific research was performed in the territorial waters of Costa Rica, Guatemala, Panama, and extended well into the international waters of the ETP (Figure 1).

The Statement of Work (SOW) for solicitation #50ABNA300010 listed the time and duration of the charter and indicated specific vessel requirements necessary for successful performance of the 30-day charter.⁹ The NICOLE K was constructed by Tacoma Boat Building Co., Tacoma WA in 1969. The NICOLE K is a raised deck, purse-seine tuna-fishing vessel with a welded steel hull and a wooden deck house. The vessel's length is 176.2 feet with a depth and beam of 17.0 and 36.1 feet respectively (Figure 2), and has a cruising speed of 13 knots with a range of 14,000 nautical miles. The main engine is a 20-cylinder, 3,600 hp General Motors diesel. There are four CAT auxiliary engines capable of providing uninterrupted 120V/60 cycle alternating current electrical supply. The estimated carrying capacity of the ship was 1100 gross tons.

The purse-seine net was 850 fathoms long and 17 strips¹⁰ (102 fathoms) deep which exceeded the minimum requirement of 12 strips

⁸Hill, S.P., R.C. Rasmussen, and T. Gerrodette 1991. Report Of A Marine Mammal Survey Of The Eastern Tropical Pacific Aboard The Research Vessel DAVID STARR JORDON July 28-December 6, 1990. NOAA Tech. Memo. 158. National Marine Fisheries Service, Southwest Fisheries Science Center, La Jolla, Calif. 133 pp.

Hill, S.P., A. Jackson, and T. Gerrodette 1991. Report Of A Marine Mammal Survey Of The Eastern Tropical Pacific Aboard The Research Vessel McARTHUR July 28-December 6, 1990. NOAA Tech. Memo. 159. National Marine Fisheries Service, Southwest Fisheries Science Center, La Jolla, Calif. 142 pp.

⁹Contract Solicitation No. 50ABNA300010, Section J, attachment 1 of the Dolphin-Safe Charter Contract.

¹⁰One strip is equal to approximately six fathoms (12-meters).

in the SOW. It was constructed of 4.25" nylon webbing. The net was equipped with a porpoise safety panel (PSP), as required in the contract, which was 180 fathoms long and 2 strips (12 fathoms) deep. It was constructed of 1.25" nylon webbing.

The charter solicitation required that the contracted vessel possess at least four operational speedboats with outboard motors of not less than 85-hp. There were five operational aluminum-hulled speedboats aboard the vessel. Each was equipped with a 115-hp outboard engine. The speedboats were used to herd dolphins during chases, to pass lines, to tow on the corkline and keep the net open, to capture and tag sea turtles, and to transport personnel and gear between vessels.

The contract required the ship to provide an operational helicopter, licensed pilot, and certified mechanic during the 30-day charter period. The helicopter was required to be able to fly a minimum of five hours to a maximum of eight hours each day. The ship's helicopter, a Bell 47G38, is a two-seated piston-powered aircraft. A single helicopter malfunction occurred during the 30-day charter that briefly interrupted aerial search effort. The malfunction resulted from water in the aviation fuel storage tank and was corrected by using a different fuel source for the helicopter.

The NICOLE K's fuel tanks were sounded by the ship's chief engineer and the NMFS field party leader prior to departure from Puntarenas, Costa Rica (APPENDIX I). The height of the fuel in each tank was recorded, and the capacity of fuel in gallons was provided in writing by the chief engineer for each tank. Every seven days, the fuel tanks were sounded to determine the volume and gallons of fuel used per day during each week of the 30-day charter period. The total number of gallons used during the charter was determined by sounding the tanks at the end of the charter and comparing the volume of fuel left in the tanks to the volume of fuel in the tanks calculated at the start of the 30-day charter (APPENDIX I-III).

The vessel possessed an eight-foot inflatable raft used during tagging operations. There was sufficient room in the pilot house to install a government-supplied laptop computer. The cook provided an abundance of freezer storage space for frozen specimens and scientific supplies. Freshwater supplies, bath, laundry, and sleeping quarters exceeded the requirements listed in the SOW.

Various electronic gear requirements were listed in the SOW. In addition to standard radar the ship had a Furuno¹¹ Bird Radar system with a range of up to 72 miles. When used by an experienced operator it effectively located seabird flocks at distances up to

¹¹Reference to trade names does not imply endorsement by the NMFS.

10-12 miles. Vessel positions were obtained from a Global Positioning Satellite (GPS) unit. Communications between the helicopter and the NICOLE K were facilitated by Raytheon VHF or ICOM HF radio sets depending on the distance between the helicopter and the ship. The helicopter communicated with the McARTHUR and its launches via VHF or HF radio sets. Communication between the chief scientist, NICOLE K, McARTHUR, and the tracking launches during capture, tagging, and release inside the net was via hand-held VHF radios. There was a SIMRAD SSB radio in the pilot house.

Daily activities were determined by the chief scientist (Michael Scott, IATTC) aboard the McARTHUR in consultation with the NMFS field party leader and the vessel captains. The decision was based on the type of activity expected during the day (running, tagging/tracking operations, etc.), prevailing weather conditions, and the cruise plan. The vessel crew were available to assist the scientific field party with installation and testing of the tracking gear, transportation by speedboat between the NICOLE K and the McARTHUR, and during sea turtle capture and tagging operations. Fishermen entered the net prior to backdown¹² with dive masks and snorkels in order to assist with capture of dolphins, lance-tagging of yellowfin tuna, and the hand-rescue of dolphins during the backdown procedure.

The chartered tuna purse-seine vessel's primary function was to facilitate the simultaneous tuna and dolphin tracking by locating, capturing, tagging, and releasing spotted dolphins and yellowfin tuna for subsequent tracking by the McARTHUR and its launches. After an aggregation of tuna and dolphin had been encircled inside the purse-seine net, the McARTHUR deployed an 18-foot launch (AR-1 or AR-2) which was used as a platform to fish for yellowfin tuna inside the net with handline gear. Handline fishing proved to be ineffective. During Sets 8 and 9 a crewman entered the net with snorkel, mask and flippers and attached ultrasonic-transmitter tags with a lance to free-swimming tuna prior to the backdown procedure. During pursing and net roll procedures, the McARTHUR's 27-foot auxiliary launches (AR-3 and AR-4) were deployed and directed to the proper position along the corkline in order to deploy the tagging team's rafts and personnel, and to be in position to conduct tracking operations following backdown. When approximately one-half of the net had been rolled aboard, three scientists from the NICOLE K, and two or more people entered the water with masks, snorkels, and fins.

¹²This is the principal marine mammal release maneuver. After approximately two-thirds of the net has been rolled aboard and tied down, the vessel's main engine is shifted into reverse. This causes the corkline located at the apex of the channel formed during the maneuver to sink. The sunken corkline is pulled under the dolphins and allows marine mammals to escape or to be hand-released by crewmen without releasing the tuna catch.

Members of the scientific field party and fishing personnel aided in the capture, tagging, and release of spotted dolphins inside the confines of the purse-seine net, and hand-released dolphins at the apex of the backdown channel during the backdown procedures. Dolphins were captured by swimmers prior to backdown, delivered to the tagging team, and placed inside an inflatable raft. The dolphins were outfitted with radio-transmitters mounted on plastic saddles which were attached to the dolphin's dorsal fin with two 1/4-in. delrin pins. Tissue plugs, removed to attach the package, were saved for genetic analysis. The delrin pins were secured by magnesium nuts that corrode in seawater, releasing the package within several days to a few weeks. The color pattern, respiration rate, length, and sex of the tagged dolphin were recorded. Tagged dolphins were released inside the net so the entire aggregation of tuna and dolphins could be liberated from the purse-seine net together.

A total of thirteen sets were made during the 30-day charter period, and eleven of those sets were made on northern offshore spotted dolphin schools when the McARTHUR was present. Two additional sets were made on tuna/dolphin aggregations after the McARTHUR had departed for San Diego. One set made during the 30-day charter period was a skunk set.¹³ Seven northern offshore spotted dolphins were captured by swimmers inside the net during the project. Six of the captured dolphins had instrument packages attached to their dorsal fins. The first spotted dolphin captured was conveyed by swimmers to the tagging station but tagging was aborted because the backdown procedure occurred prematurely. Six spotted dolphins were tagged during five ensuing sets. Radio-transmitters were attached to the dorsal fins of all six of the dolphins. Three captured dolphins also had time-depth recorders (TDRs) attached to the radio-transmitter package (Table 1). Two of the three TDR packages deployed were subsequently recovered by setting on previously tagged dolphins.

After tagging procedures were completed, the fishing master attempted to simultaneously release the entire tuna/dolphin aggregation by releasing the bow ortza (Set 1) or by a modified backdown procedure (Sets 2-11). The AR-3 and AR-4 were deployed and positioned, prior to tuna-dolphin release, outside the PSP corkline near the apex of the backdown channel. Both of the tracking launches were equipped with sonic and radio-tracking gear capable of tracking dolphins with attached radio-transmitters and tuna with attached ultrasonic transmitters as soon as the animals were released from the net.

Three yellowfin tuna were tagged during Set 8. One tuna that tangled in mesh while the purse-seiner rolled net was tagged with

¹³A skunk set occurs when the net is deployed and no tuna are captured.

a depth-sensitive transmitter (60 kHz) and released back into the net. It appeared in poor physical condition, however, and was not expected to survive. Therefore, when two other tuna were tagged by lancing during backdown, one was tagged with another depth-sensitive transmitter at the same frequency while the other was tagged with a pinger (69 kHz). All of the dolphins and about 13 of the estimated 15 tons of tuna were released during backdown, including the previously moribund tuna which was observed to be swimming with the school in good condition. Unfortunately, this led to confusion in tracking the tuna when the two fish bearing transmitters at the same frequency swam in different directions. The signals were lost before a heading could be determined. Two yellowfin tuna were lance-tagged inside the net during Set 9. We were unsuccessful in releasing the tagged tuna during the backdown procedure and attempts to capture the fish after backdown were also unsuccessful.

After completing sets on dolphins, the scientific personnel's primary responsibilities were to process any dead dolphins incidentally killed during sets and to assist an IATTC scientist with his food-habits-study data collection. During Set 1 (Ortza release experiment) two dead female northern offshore spotted dolphins (one fused and one mottled) were recovered from the net and sampled according to standard NMFS cetacean life history sampling protocol. The dorsal fins were also collected. Six yellowfin tuna were processed by the IATTC food-habits scientist according to standardized sampling procedures. The tuna and dolphin biological specimens were transported to the McARTHUR by speedboat on the evening of 9 November 1992. Yellowfin tuna were also sampled during sets 2-4, 8-10, and 12. A total of 152 yellowfin tuna were processed aboard the NICOLE K. During the tuna sampling sessions each yellowfin tuna's fork length, sex, and a general description of stomach contents were recorded (Tables 2-8).

NMFS scientists David Au and Robert Pitman were responsible for sampling fish by-catch species, paying particular attention to sharks and billfish. When specimens were available they recorded fork length, sex, and identified stomach contents. Additional duties included observations of seabird flock activity relative to tuna schools, for development of a general hypothesis on tuna foraging. These observations were directed at determining whether seabird flock size and species composition are correlated to the actual size of the tuna school. Also of interest was how and when seabird flocks form and feed over schools of yellowfin tuna. Au and Pitman hoped to sample subflocks within seabird flock aggregations feeding over tuna. Samples of seabird stomach contents would be analyzed to determine seabird prey and the extent to which seabird diet overlapped with tuna and/or dolphin diet. Unfortunately, we seldom encountered the type of large bird flocks typically associated with tuna/dolphin aggregations, therefore, opportunities to study seabird flock behavior and feeding habits during the 30-day charter period were rare.

The scientific field party aboard the NICOLE K assisted with tracking efforts on two occasions. On 22 November 1992 following Set 7, the vessel tracked a 177-cm fused female northern offshore spotted dolphin (D2). D2 was tracked from 21:00-22:30 hours. Our assistance with tracking effort provided time for the tracking launch to undergo routine maintenance, refueling, and to make a crew change. On 23 November 1992 following Set 8, the vessel tracked a 187-cm fused female northern offshore spotted dolphin (D4) from 14:00-21:50 hours. At the end of that set, three tagged spotted dolphins were released with the rest of the dolphin school. Two of the tagged dolphins (D2 and D3) traveled in one direction with one group of spotted dolphins. The other tagged dolphin (D4) was associated with another group of spotted dolphins that travelled in the opposite direction. The McARTHUR and it's tracking launches concentrated on D2 and D3 because D3 was tagged with a TDR unit. They abandoned the effort late in the day and traveled to where the NICOLE K was located and resumed tracking of D4 at 21:50 because it's school was carrying more fish than the school of tuna associated with D2 and D3. Whenever tracking operations were underway, the NICOLE K maintained close proximity and frequent radio communication with the McARTHUR to provide assistance with tracking operations or air support if required.

During periods when the vessels were searching and the Beaufort sea state was favorable for locating sea turtles (Beaufort 0), a speedboat with a driver, and two NMFS scientists (Armstrong and Pitman) was deployed from the tuna purse-seine vessel in order to capture, measure, and tag sea turtles. The NICOLE K was capable of launching and picking up a speedboat while it was running so there was no break in search effort. The speedboat driver was outfitted with a headset with which he maintained radio contact with the fishing master, navigator, and fish spotter in the crow's nest. Crew members directed the speedboat driver to sea turtles located during their scans for tuna/dolphin aggregations and the scientists located sea turtles from the speedboat also. During sea turtle operations the speedboat paralleled the ship's course or followed the ship. There were five speedboat deployments to conduct turtle operations. Scientists captured and tagged 18 olive ridley sea turtles, *Lepidochelys olivacea*, (including one tagged individual) during the 30-day charter period (Table 9, and APPENDIX IV).

On the morning of 30 November 1992, large items of scientific gear not required for the remainder of the 30-day charter and NMFS scientist David Au were transferred to McARTHUR by speedboat and it departed for San Diego at 09:35. Armstrong, Lindsay, and Pitman remained aboard the NICOLE K for the remainder of the 30-day charter period with the goal of traveling to an area where the vessel could relocate and track previously tagged dolphins, recover the third TDR, and locate and make sets on free swimming yellowfin tuna (schoolfish) and/or tuna associated with flotsam (logfish). The purpose of this segment of the charter was to collect stomach samples from tuna and upper-trophic level predators associated with

tuna. The vessel was located at 15°39'N and 106°58'W when the McARTHUR departed for San Diego and was four to five days from the closest schoolfishing/logfishing grounds.

The NICOLE K encountered rough weather associated with a tropical depression during the first two days of travel following the McARTHUR's departure. On 2 December 1992, searching effort was resumed and the helicopter made two flights a day during the succeeding few days. On 5 December 1992, the vessel entered productive Costa Rican waters. A few schools of common dolphin, *Delphinus delphis*, were located by fish spotters, and seven olive ridley sea turtles were captured, measured, and tagged. On 6 December 1992, two sets were made on dolphin schools (Sets 12-13). The ship's hydraulic system malfunctioned following backdown on Set 13. The breakdown of the hydraulic system made any further fishing operations impossible. The vessel was instructed by the owner to head directly to Puntarenas, Costa Rica, for repairs and arrived at 12:00 on 7 December 1992.

Recommendations for Future Operations

During multipurpose research cruises as ambitious as the 30-Day Dolphin-Safe Charter, much can be learned by trial and error and by those who participated in the project's planning and execution. Some of what was learned can be applied to similar efforts in the future. A list of suggestions for future work involving the charter of a commercial tuna purse-seine vessel follows.

General:

The procurement process to charter a commercial fishing vessel is a very complicated procedure. It should begin at least nine months prior to the starting date of the proposed research project. Prior to soliciting for the contract it is helpful to contact vessel owners and tuna industry leaders and provide information about the proposed research goals and the duration of the project in order to encourage interest in bidding on the charter.

Before departure on the research cruise it may be informative to n conduct meetings with scientists and experienced fishermen in attendance. The meetings could elicit suggestions for promising areas of Dolphin-Safe research, and fishermen could provide meaningful insight about the potential success or failure of proposed scientific experiments at sea. Additions to an equipment list (APPENDIX V) can be discussed at these meetings.

To increase the efficiency of field work at sea, extensive pre-cruise testing of proposed research methods should be undertaken. For example, NMFS observers working aboard commercial tuna purse-seine vessels could be equipped and trained to experiment with various techniques to catch tuna inside the net, and to test innovative methods to tag fish as long as these activities do not interfere with their primary observer duties. A priority list of

research activities would allow the chartered vessel to be utilized as effectively and efficiently as possible.

Prior to departure on a chartered commercial fishing vessel, the field party leader should conduct a meeting with all members of the fishing crew in attendance in order to introduce the scientific field party to the crew. During the meeting it would be useful to explain the SOW to the fishing crew so they understand what is expected of them during the charter. This meeting would be a good opportunity for the members of the scientific field party to clarify special needs or requests, especially if the contractor is attending the meeting. This informal forum provides the vessel's crew members with the chance to ask the scientists and fishing master questions about the project. When scientists and fishing crew members are comfortable with each other there is a greater potential to generate enthusiasm and good will. The fishing crew has many years of experience at sea which is a valuable resource.

If the chartered vessel is working in concert with a NOAA Research Ship, it is critical to convene a meeting of officers and scientists from both vessels prior to conducting research operations, particularly if the vessels will be operating near each other. If logistics permit, a meeting prior to the sailing date is encouraged. If it is not practical to meet before the sailing date, a meeting should be arranged as soon as the vessels reach the designated research area. Discussions should address communications, operational protocols, searching and fishing procedures, inter-vessel transportation, safety. All licensed personnel and other individuals directly involved with research operations from the chartered fishing vessel should attend the meeting.

Specific:

In order to increase the chances of locating suitable tuna/dolphin aggregations, the participating vessels should attempt to maximize their searching efficiency. This could be enhanced by placing more trained marine mammal observers aboard the McARTHUR during the project. It is important to stress at the pre-operations meeting the importance of having the ships maintain parallel courses and relatively fixed perpendicular distances in order to ensure the best possible search configuration for marine mammals.

The NICOLE K's echo sounder was an older model SIMRAD paper tracing fish finder and it was not effective for surveying fish associated with logs. A side-scan sonar unit is recommended to be listed in the SOW of the charter solicitation if fishing effort is going to be directed toward fish associated with flotsam or Fish Aggregating Devices (FADs).

During dolphin tracking operations that followed Set No. 5, the tracking launches were occasionally located within 0.1-0.2 miles of the dolphin school associated with the radio-tagged dolphin(s).

The fishing master observed dolphin tracking operations from the helicopter on several occasions and, in his opinion, the dolphins being tracked after Set No. 4 were avoiding the tracking launches. If the dolphins do attempt to avoid the tracking launches then at least two suggestions are appropriate. First, as long as there are no tuna being tracked, the operators of tracking launches should maintain a greater distance between the radio-tagged dolphin(s) and launches, and if necessary, use the chartered tuna purse-seine vessel and the McARTHUR for fixes if they lose the radio-transmitter signal. A second suggestion that applies to tracking dolphins alone is to track the dolphins only from the McARTHUR and the chartered tuna purse-seine vessel, especially during multi-dolphin tracking efforts or if a school splits. This method proved to be effective since the larger vessels had their tracking antennas installed higher above the water than the tracking launches and had greater radio-transmitter reception at longer distances. These suggestions do not apply to tracking efforts that involve tagged dolphins and tagged tuna. During simultaneous tracking efforts, it is necessary to remain within reception range of the sonic tags ($< 3/4$ mi); therefore, the launches have to approach the dolphins schools more closely to track the tuna and make behavioral observations as well.

Divers equipped with scuba gear could be used to attach sonic-tags to tunas early in the set sequence. When the application of sonic tags was completed, the divers would be free to record behavioral observations of tuna and dolphins in the net on film or video. If a satisfactory number of sonic-transmitters were applied prior to backdown, there would be an opportunity for divers to lance-tag additional tuna with colored spaghetti-tags. Large numbers of spaghetti-tagged tuna might provide a simple method to determine how long the tuna-dolphin bond persists when tuna are observed during subsequent sets on the same school of dolphins.

Specific projects should be designed to take advantage of the chartered tuna purse-seine vessel's capabilities as a research tool. For example, we discovered that fish and soft bodied invertebrates were deposited at the apex of the backdown channel as a result of the backdown process. Various fish species were collected and frozen but we did not have jars or chemical preservatives to collect the soft bodied invertebrates. During periods of time when environmental conditions prohibit the McARTHUR from being able to deploy and recover tracking launches and conduct primary tagging and tracking operations, the chartered tuna purse-seine vessel could be used to test alternative fishing techniques, use of live bait and artificial lures to catch tuna inside the net, simultaneous release techniques, tagging methodology, and other projects to elucidate the nature of the tuna-dolphin bond.

ACKNOWLEDGEMENTS

The capacity to conduct the large scale research operations required during the Dolphin-Safe Charter would have been impossible without the expert seamanship, hard work, and the absolute cooperation the fishing master, the chief engineer, and the crew of the NICOLE K. There was never an occasion when there were not sufficient numbers of fishermen to operate speedboats, run deck equipment, stack the net, or to assist with dolphin capture, tuna and dolphin tagging and hand rescue during backdown. Special thanks to George and Theresa Platt, Zen Kozminski, William Madruga, Phil Peterman, and the crew of the NICOLE K for their enthusiastic support during the 30-day Dolphin-Safe Charter. Cooperation between the Southwest Fisheries Science Center's Alternative Gear Program, the leaders of the United States Tuna Fishing Industry, and the skippers and crew working aboard tuna purse-seine vessels is essential to the development of innovative technologies that will lead to increased catch rates of tunas and decreased dolphin by-catch. John A. Young, Charles W. Oliver, Paul Spizziri, and Jay Jepson spent many months putting together the nuts and bolts of the Dolphin-Safe Charter and I would like to acknowledge their hard work. Charles W. Oliver, Liz Edwards, Michael Scott, Susan Chivers, David Au, and Robert L. Pitman reviewed the materials and offered useful suggestions and guidance.

SCIENTIFIC PERSONNEL:

Chief Scientist: Dr. Michael Scott, IATTC
Survey Coordinator: Karl F. Mangels, LTJG, NOAA, SWFSC

<u>NAME</u>	<u>POSITION</u>	<u>ORGANIZATION</u>
Dolphin-Safe Study Personnel		
NOAA Ship McARTHUR		
1. Dr. Michael Scott	Chief Scientist	IATTC
2. Dr. Robert Olson	Scientist	IATTC
3. Howard Rhinehart	Scientist	IATTC
4. Dr. Kim Holland	Scientist	UH
5. Bradley Weatherbee	Scientist	UH
6. Dr. Susan Chivers	Scientist	SWFSC
7. Marco Garcia	Scientist	IATTC
8. Lisa Ballance	Scientist	SWFSC

Dolphin-Safe Study Personnel

Contracted Commercial Fishing Vessel NICOLE K

1. Wesley Armstrong	Scientist	SWFSC
2. Dr. David Au	Scientist	SWFSC
3. Richard Lindsay	Scientist	IATTC
4. Robert Pitman	Scientist	SWFSC

SWFSC: Southwest Fisheries Science Center, NOAA
IATTC: Inter-American Tropical Tuna Commission
UH: University of Hawaii

TUNA VESSEL NMFS FIELD PARTY LEADER'S REVIEWED AND REVISED FIELD NOTES:

At the end of each day of the 30-day "Dolphin-Safe" charter, I recorded field notes on a Zenith-286 data system laptop computer. The notes summarized travel, logistics, installation of equipment, fuel use, meetings with scientific and ship personnel, inter-vessel communication, a Coast Guard boarding, vessel operations, dolphin sets, tagging and tracking efforts, ancillary projects, and biological data collected during the charter. The information should be useful for parties interested in conducting similar efforts involving the charter of a commercial fishing vessel. The text that follows is a copy of my reviewed and revised field notes during the Dolphin-Safe Simultaneous Tracking of Tuna and Dolphin charter aboard the F/V NICOLE K from 4 November 1992 to 7 December 1992.

4 November 1992

NMFS scientists participating in the Simultaneous Tagging and Tracking of Tuna and Dolphins Study departed San Diego Airport at 07:55 and arrived at Miami International Airport at 15:50. During the flight, I introduced myself to George Platt (owner of the F/V NICOLE K) and told him that I would like to meet him inside the Miami International Airport terminal and introduce him to the other NMFS scientists aboard the flight. After a brief meeting in the airport terminal, Armstrong, Pitman, and Platt departed Miami International Airport at 17:00 and arrived in San José Costa Rica, at 19:00. We cleared customs and were met at the airport by a driver (arranged by Mr. Platt) and transported to the Fiesta Hotel in Puntarenas, Costa Rica. A meeting was scheduled with Mr. Platt for 07:30 the following day.

5 November 1992

The morning meeting was convened at the Fiesta Hotel with Mr. Platt. We discussed the vessel's schedule, and the travel status of NMFS/IATTC personnel that were in route to Puntarenas. Mr. Platt made arrangements for Bob Pitman and me to be picked up after breakfast and driven to the ship's agent, Arturo Beeche's office. When we arrived at the office there was a FAX addressed to me from Tim Price, the Fleet Manager at the Southwest Regional Office in Long Beach. The FAX dealt with my responsibility to make weekly dolphin mortality radio reports to the Southwest Regional office during the post-charter segment of the cruise. He sent NMFS Tuna/Porpoise Observer coded radio report sheets and the cruise number (#1477) for the charter and post-charter period. He informed me that all necessary NMFS observer data forms and dissection gear would be left aboard the vessel by the observer currently aboard NICOLE K.

Two additional FAXs sent by Chuck Oliver from Southwest Fisheries

Science Center (SWFSC) concerned NMFS scientist David Au's travel status and SWFSC's tentative plans to get him to Costa Rica to meet the ship before the scheduled departure date of 6 November 1992. I made arrangements with the ship's agent to have David Au picked up in San José Costa Rica, if his travel arrangements worked out. I discussed David Au's predicament with Arturo Beeche, and he informed me that it was unnecessary for U.S. citizens to have a visa to enter Costa Rica. This information was sent to Chuck Oliver at SWFSC. While we were at the agent's office, Arturo Beeche contacted the NICOLE K via VHF radio. The agent made arrangements for the vessel to move to anchorage at Caldera Harbor Costa Rica, at approximately 13:00. We were introduced to the NICOLE K's navigator at the agents office. He provided Bob and I with a ride to the Fiesta Hotel. We checked out of our rooms and transferred personal gear into George Platt's room to store it until we were picked up and driven to the NICOLE K.

The ship's navigator picked up Bob and me at the hotel and we loaded our gear into the back of his pickup truck. We arrived at Caldera Harbor at 13:00. The NICOLE K could not pull along side of the pier at Caldera Harbor because several large ships occupied all available space so the net skiff was deployed to transport us to the ship. Once our personal gear was aboard the ship I asked to meet Bill Madruga, the fishing master of the vessel. After introductions were made he showed us to our quarters. We unpacked our personal gear and waited for the ship's agent to deliver the tracking equipment that had been shipped and air-freighted to Puntarenas, Costa Rica from SWFSC in La Jolla, CA USA.

Rick Lindsay (IATTC scientist) arrived at the vessel at 14:30 with the ship's agent and the boxes of equipment shipped from SWFSC (Appendix V). The equipment was inventoried on the work deck of the vessel to determine if everything on the packing list had arrived. There were two items missing from the shipping container (stainless steel hoops for experimental tuna capture net), but they were found among the items that were air-freighted from San Diego.

A FAX addressed to Michael Scott was transmitted from the NICOLE K to the McARTHUR via KOZPLA FISHING CORP in San Diego (we could not send the FAX directly ship-to-ship for some unknown reason) to designate a rendezvous position for the two ships, and to set up a radio communication schedule. Capt. Madruga was interested in the McARTHUR's sailing status and projected departure time from Rodman Air Force Base in Panama.

The NICOLE K moved to the anchorage outside of the State Pier in Puntarenas, Costa Rica at 17:00. George Platt, Bill Madruga, and Wes Armstrong had dinner together in Puntarenas in order to conduct a formal discussion concerning the performance of the Dolphin-Safe Charter's Statement of Work proscribed in Contract No. 52ABNA300010 Dolphin-Safe Charter: Section J Attachment 1, and to answer questions posed by Capt. Madruga related to the safety and

logistics of planned scientific research operations aboard the tuna purse-seine vessel. All points relevant to vessel operations and research goals of the Simultaneous Tagging And Tracking Of Tuna And Dolphins Study were covered. I asked the Capt. Madruga to assemble the fishing crew the following morning in order to introduce the scientific party, explain the SOW, the goals of the research, and to answer any questions raised about the charter. He agreed that it was a good idea.

6 November 1992

I received a phone call from Michael Scott and we designated 08°00'N and 85°00'W as the rendezvous position. We arranged for the ships to meet at sunrise on 8 November 1992. We discussed departure times of both vessels and restated the need to set up a daily radio schedule which specified radio frequencies to be monitored by both ships twenty-four hours a day until both vessels were within VHF radio range of each other. A meeting was recommended between the vessel command, NOAA Corps officers, fishing master, chief engineer, helicopter pilot, McARTHUR's scientific field party, McARTHUR's electronic technician, and the scientific field party working aboard the purse-seiner when the vessels arrived at the rendezvous position. I requested an estimate of the McARTHUR's ETA at the proposed rendezvous position and passed the NICOLE K's telex number (8051500673 KOZPX) to the McARTHUR.

The entire fishing crew gathered in the NICOLE K's galley for a meeting to explain the SOW and to answer any questions concerning the 30-day charter. The scientists were formally introduced to the fishermen by George Platt. Each scientist gave a brief explanation of his duties during the charter. All special needs or requests of the scientific party were brought up during the meeting to ensure there were no misunderstandings about what was required in terms of equipment or personnel assistance to accomplish the goals of the project. The meeting was a useful forum for questions and answers by scientists and fishermen. I felt it dispelled any rumors or anxieties about our presence aboard the vessel.

The fuel tanks were sounded by the chief engineer and I prior to the NICOLE K's departure from Puntarenas Costa Rica, to estimate the amount of fuel stored in various storage tanks (APPENDIX I). The chief engineer volunteered to provide a written weekly estimate (on each Thursday) of fuel used during the chartered portion of the trip. The NICOLE K departed the anchorage at 14:30. A telex was sent to the McARTHUR at 15:00 which identified the vessel's radio call sign (WSA 9904) and the radio frequencies monitored by the ship (8 alpha = 8294.0 MHz, 6 charlie = 6230.0 MHz). Rick Lindsay and the chief engineer, Phil Peterman, installed the four-antenna array (Yagi-Uda antennas oriented at 90° intervals) above the crow's nest and a pair of tracking antennas on the helicopter's landing skids. The scientific field party met informally with Bill

Madruga after dinner to plan for the upcoming day and to discuss their thoughts and ideas about what sorts of projects could be conducted aboard the vessel during the 30-day charter. The vessel ran south all night to the rendezvous position.

7 November 1992

The NICOLE K arrived at rendezvous position (08°00'N and 85°01'W) at 05:00. At first light (05:50) the vessel started searching for signs of dolphin associations (bird flocks, splashes), as well as tuna not associated with dolphins (logfish, schoolfish, breezers, jumpers). At 06:25 I attempted to call the McARTHUR by radio but did not make contact. Rick Lindsay and Phil Peterman completed the installation of the remainder of the electronic tracking gear components by midmorning.

Michael Scott called the NICOLE K at 07:37. A change in the previously designated rendezvous position was suggested to Michael Scott because the NICOLE K's fishing master planned to travel south all day. Up until now we had not observed very promising signs of fish life. It did not make sense to back-track over an unproductive area after the vessels met in the morning. The new rendezvous position (7°00'N and 85°00'W) decreased the distance the McARTHUR had to travel to meet the NICOLE K. The rendezvous position was changed and we arranged to speak again at 20:00 (Costa Rican time). We set up a radio schedule for inter-vessel communications at 08:00, 14:00, and 20:00. This schedule would not interfere with Capt. Madruga's access to daily fishing/weather information from his code group on the radio.

The fish spotter in the crow's nest located a small scattered school of spotted dolphins at 08:40. The sighting position was 07°39'N and 85°13'W. The school was observed by the members of the scientific field party for approximately one hour. During the observations, the vessel would slowly creep up to within 1.5 miles of the school and then drift when the dolphin school started running and breaking apart into subgroups. When the vessel drifted, the dolphin school tended to coalesce into a tight group. This procedure was repeated several times to facilitate observations of dolphin, seabird flock, and yellowfin tuna behavior by scientists. The vessel was in and out of scattered rain squalls all day.

At 14:30 the fish spotters had ceased seeing signs of tuna/dolphin aggregations. I requested the use of a speedboat and a speedboat driver to field test a Telonics radio-transmitter in conjunction with the recently installed Yagi-Uda antennas, Telonics radio receiver, scanner, and the ATS direction finder. I accompanied the speedboat driver and carried the radio-transmitter unit in my hand. Before the speedboat travelled very far from the ship, the magnet was removed from the outside of the transmitter device (to turn the transmitter on) and Rick Lindsay indicated the radio-transmitter

receiver and ATS installed in the crow's nest were picking up a signal and indicating direction. The speedboat traveled 5 to 6 miles ahead of the NICOLE K. Rick directed the ship to circle slowly to test the ATS. The radio-transmitter was submerged in the water with the antenna above the water's surface to simulate being attached to the dorsal fin of a surfacing free-swimming dolphin. The radio-transmitter and the tracking system performed well during the test.

After we returned to the purse-seine vessel, the helicopter was deployed to test its tracking system. I remained on board the ship holding the radio-transmitter in my hand on the bow of the ship while the helicopter made several six-mile radius circles around the ship. The radio-receiver and ATS installed in the helicopter functioned properly. The deck boss and crew members helped to construct two experimental tuna catching devices out of the steel hoops and the wooden poles shipped from San Diego. The nets were designed to work in the same manner as the nets used to capture turtles during the marine mammal surveys conducted by NMFS in the ETP. A stainless steel hoop was attached to an eight-foot wooden pole. A small net with a purse line incorporated into the mouth of the net was attached to the stainless steel hoop with masking tape. The tape allowed the net webbing to tear away from the hoop when a fish was captured and the purse line was pulled. If there was a large quantity of tuna in the net and handline fishing efforts were not effective, the experimental tuna catching device might be utilized to capture tunas pushed close to the surface during backdown. Two units were constructed. At 20:00 the McARTHUR was called by radio but I did not make contact. Rendezvous scheduled with the McARTHUR in the morning at first light.

8 November 1992

The U.S. Navy Warship Cleveland 7 contacted the NICOLE K at 03:45 on VHF radio channel 16 and requested standard pre-boarding information. I got up to answer any questions about the cooperative research operations planned for the area. At 04:00 the Cleveland 7 requested information about the Dolphin-Safe Charter, our affiliation, and the government contract number for the charter. I provided the information requested and we monitored channel 16 while they ran the information through their computer and chain of command. At about 05:30 (first light) they informed Capt. Madruga that they were going to board the NICOLE K. I contacted the McARTHUR to advise the commanding officer, Dave Peterson of our situation. I asked Cmdr. Peterson to keep coming toward us so the ships would be in close proximity after the boarding procedure was completed.

Prior to boarding, the radio officer on the Cleveland 7 requested the crew of the NICOLE K to assemble on the work deck. The Coast Guard boarding party was comprised of four members of the Pacific Area Tactical Law Enforcement Team. The boarding officer - QM1

Keith Scally (Telephone: 1-619-524-4455/54) and the other members of the boarding party conducted the boarding procedure in a professional manner. Officer Scally interviewed me and wanted to know more about our planned operations in the area so I provided him with a verbal description of the Simultaneous Tagging and Tracking of Tuna and Dolphins Project, and photocopies of the cruise announcement,¹⁴ and the Michael Scott's draft of the NOAA Research Cruise plan for the Dolphin-Tuna Tracking Study which described the planned research operations during the charter. A brief safety inspection was conducted after the boarding party determined that the vessel's documentation was in order. When the safety inspection was completed the boarding party departed.

I contacted Michael Scott and made arrangements to transport personnel attending the pre-operations meeting to the McARTHUR via the net skiff. Our party consisted of Wes Armstrong, Bob Pitman, David Au, Rick Lindsay, Bill Madruga, Phil Peterman, and the helicopter pilot and mechanic. We assembled in McARTHUR's wardroom with the ship's officers and the NMFS/IATTC scientific field parties aboard the McARTHUR. Introductions were made and the meeting got underway.

A discussion was initiated about inter-vessel and vessel-to-helicopter communications. It was established that the NICOLE K, the tracking launches, the helicopter, and the McARTHUR would monitor stations 16 and 13 on their VHF radio sets. The NICOLE K would communicate by UHF radio frequencies (working side) with its speedboats during chase and set operations. The McARTHUR's electronics technician provided the Capt. Madruga with the McARTHUR's two house frequencies, 164.026 MHz and 164.075 MHz. A radio schedule was set up. We agreed to monitor 8A and 6C if the two ships were out of VHF radio range and needed to communicate.

The next phase of the discussions focused on how the vessels would position themselves during search effort. It was decided to keep the vessels running parallel and within 10-12 miles of each other to minimize the time required to close the distance between the ships during chase, set, and tagging operations. This configuration would also maximize the effective search area covered by the two vessels. Capt. Madruga and Cmdr. Peterson determined how the McARTHUR would orient itself with respect to the NICOLE K during chase, set, and tagging operations. I presented a brief description of tuna purse-seine operations to the people attending the meeting to familiarize the officers and scientific field parties on both ships with the chronology of important stages of set operations. I inquired if the McARTHUR's 18-foot Boston Whaler (AR-1) and 18-foot flat-bottomed Monarch-Launch (AR-2) were equipped with towing bridles, and if so, would they assist the

¹⁴NOAA Ship McARTHUR, Cruise Number AR-92-04

NICOLE K's speedboats by towing on the corkline to keep the net open during tagging operations? They were not equipped with towing bridles and would not be used to help keep the net open.

Cmdr. Peterson stated his vessel's limited ability to launch and retrieve the two 27-foot, seven-ton, tracking launches (AR-3, and AR-4) from the McARTHUR in short-period swells and Beaufort sea state greater than 3. Therefore a protocol was instituted in the event of a tuna/dolphin sighting that could lead to a set. When a tuna/dolphin aggregation was located and was judged to be suitable for a set, I would contact the McARTHUR by VHF radio and inquire if launches could be deployed. Michael Scott and Cmdr. Peterson would assess the situation and decide whether tagging operations should be attempted. We also discussed the latest possible time (cut-off) that tagging operations could be initiated to complete research operations before dark and decided on 14:00. It was determined that if tagging operations could not be performed due to weather, sea conditions, or because cut-off time had been exceeded, permission to conduct ancillary projects could be requested by the NMFS field party leader aboard the NICOLE K and granted or denied by the chief scientist.

Helicopter operations during tracking operations were covered during the meeting. Bob Pitman and Bob Olson informally discussed fish stomach content sampling methodology. They outlined the specific data to be collected during sets when tuna and by-catch species were brought aboard the NICOLE K. At the beginning of the charter, Michael Scott indicated that successful tuna tagging would be the event which would determine whether or not to initiate tagging of dolphins during a set. If Kim Holland and Bob Olson did not catch and tag at least one yellowfin tuna in the net prior to backdown, the capture and attachment of radio-transmitters to the dorsal fins of spotted dolphins would not be attempted. When sets were aborted because the tuna tagging team failed to catch tuna with handline gear, I suggested that it would be a good idea to practice the bow ortza¹⁵ release maneuver. If strong subsurface currents were detected or if a large number of dolphins were captured in the net during a set, the fishing master would use the standard backdown procedures to release captured dolphins. At the conclusion of the meeting Capt. Madruga invited all interested parties to the NICOLE K for a tour of his ship.

Bob Olson and Kim Holland installed their underwater sonic tracking antenna, and VEMCO ultrasonic receiver on the 27-foot tracking launch (AR-4) to field test their sonic tracking equipment prior to

¹⁵A metal triangle to which the end of the net is attached. A typical tuna purse seine tapers up gradually from its maximum depth (generally 12-18 strips (each strip is approximately 6 fathoms)) to the ortzas. The bow ortza is at the sack end of the net and it is hauled aboard last.

starting search effort. All members of each vessel's crew and scientific parties were returned to their respective ships at approximately 11:00. At 11:50 the two ships commenced searching effort.

The NICOLE K's helicopter was launched at 13:40 with the fish spotter (Bill Madruga was the fish spotter on all helicopter flights during the charter) aboard to look for tuna-dolphin associations. Approximately one half hour later, a school of spotted dolphins was located by Capt. Madruga and the NICOLE K was directed to head toward the school at full speed. The McARTHUR was contacted by VHF radio and the NICOLE K's new course heading was passed to the bridge watch officer. The bridge watch officer was asked to notify the chief scientist that a tuna/dolphin association suitable for tagging operations had been located. Michael Scott and Cmdr. Peterson informed us that the seas were too rough to deploy tracking launches, so tagging operations were not attempted on this tuna/dolphin aggregation.

The sea conditions were not too rough for the tuna purse-seine vessel to chase and attempt to set on the school. Although tagging operations could not be conducted, I suggested it would be a good idea to make a set on this school anyway. If a set was made, the tuna tagging team could be picked up in one of the NICOLE K's speedboats and transported inside the net to test bait, lures, and handline gear. The tuna tagging team was concerned about the limited supply of frozen bait on hand, and they preferred to wait until an actual tagging operation before using their bait. A decision was made to not make a set and try to locate the dolphin school in the morning. Cmdr. Peterson indicated he wanted Michael Scott, Bill Madruga, and I to meet with him after dinner to discuss inter-vessel research operations strategy. The NICOLE K was directed to follow the tuna-dolphin aggregation and the associated seabird flock. The scientific field party recorded behavioral observations until the sun went down.

After dinner, Bill Madruga and I traveled to the McARTHUR to meet with Michael Scott and Cmdr. Peterson. Prior to the meeting, I wrote down some questions about how the NICOLE K should be utilized when the Beaufort sea state was too high to launch tracking launches, and after the cut-off time (14:00) for tagging operations.

Summary of questions:

1. If we have not made a set by cut-off time, are not involved with a tracking operation, or if the Beaufort sea state was too high to deploy tracking launches; can the NICOLE K make sets on tuna-dolphin associations in order to:

a. practice bow ortza release?

b. attempt to catch tuna inside the net or inside

backdown channel to determine which method is most effective?

c. deploy rafts and practice catching dolphins inside the net?

d. deploy a speedboat so seabirds can be collected prior to a set in order to collect stomach contents of sea birds for comparison with tuna stomach contents?

Actual discussions at the meeting

Michael Scott and Cmdr. Peterson expressed their concerns about the weather conditions and presented an option to move northwest based on data detailing historical weather patterns for the study area in November. They were interested in Capt. Madruga's opinion about whether or not there might be tuna and spotted dolphins in the areas that they were suggesting. He told them that we could find dolphins and tuna just about anywhere in the proposed study area. The consensus opinion was to drift all night. If the sea state was suitable for deploying tracking launches, we would attempt to relocate the school of spotted dolphins located today and make a set to conduct tagging/tracking operations. If the sea state was unsuitable to launch the tracking launches, then the vessels would set a course northwest and search for tuna-dolphin aggregations on the way.

The cut-off time for tagging operations was designated to be 14:00. On any day (except during tracking operations), after the cut-off time was reached without locating a suitable tuna/dolphin aggregation for tagging/tracking operations, the scientific party aboard the NICOLE K was free to conduct ancillary projects and permitted to make purse-seine sets (after consultation with Michael Scott). These sets would be made on tuna-dolphin associations, logs, and breezers of schoolfish in order to practice ortza release, dolphin capture, catching fish inside the net, or collect seabirds. On days when it was too rough for deploying tracking launches, the NICOLE K was permitted to make sets (after consultation with the chief scientist) and operate as above.

9 November 1992

At 05:40 the wind was blowing 15-18 knots with a 3-4 foot swell. The Beaufort sea state was 4. Conditions were not suitable for deployment of the tracking launches so the ships headed northwest to look for better weather conditions and tuna/dolphin associations. Around noon the wind speed decreased and the Beaufort sea state dropped below 3. The sea conditions became appropriate for deploying the tracking launches. The vessel passed through a patch of olive ridley sea turtles between 12:10 and 13:29. Six turtles were observed. The noon position was 7°47'N and 85°33'W. The helicopter was used for search effort from 1230 until 1430. During Set 1, Capt. Madruga directed the chase and the set (and all subsequent chases and sets) from the helicopter.

Summary of marine mammal sightings

1. A small group of bottlenosed dolphins, *Tursiops truncatus*, (fishing master estimated 8 individuals) was located from the helicopter.

2. Two sightings of short-finned pilot whales, *Globicephala macrorhynchus*, were reported by the fishing master (one group was estimated to be 15 individuals, no estimate for the other group).

3. Two groups of "whitebellies" (unidentified whitebellied dolphins, most likely common dolphins or striped dolphins, *Stenella coeruleoalba*, were reported by the fishing master. One school of "whitebellies" was reported by crewman aboard the NICOLE K.

4. A school of spotted dolphins was located Capt. Madruga. He estimated the school size at 300-400 individuals prior to set. Set 1 was made on this school of spotted dolphins.

Capt. Madruga made a set on a school of northern offshore spotted dolphins at approximately 16:00 and the set position was 7°58'N and 85°43'W. Set 1 was made on an estimated 300-400 spotted dolphins. Most of the dolphins escaped or evaded the set prior to encirclement.¹⁶ An estimated 24-30 dolphins were captured. The set was made after the designated the cut-off time for tagging operations. Since there were a small number of dolphins in the net, tuna were present, and the sea state was very calm, it was decided that this would be a good opportunity to test the simultaneous release of dolphins and tuna using the bow ortza release method.

Set No. 1

At the encirclement stage of the set sequence, almost all the tuna purse-seine's towline¹⁷ was unwound from the winch drum (generally less than 200 fathoms goes out during a set) so it took longer than usual to bring the towline cable aboard. This delayed the start of the net pursing process. The officer standing watch on the McARTHUR's bridge was called and informed that it would be safe to bring the ship closer to the net when the towline was in, and deploy the AR-2 so the scientific party could make observations inside the net. Capt. Madruga reported an estimated 10-15 tons of

¹⁶The point in the set when the purse seine vessel meets the net skiff and completes the circle. This is when the bow ortza is passed from the net skiff to the seiner.

¹⁷The towline is the cable that is attached to the stern ortza. Unless the vessel makes an ortza to ortza set, there will be anywhere from a few fathoms to several hundred fathoms of towline released during a set on dolphins.

yellowfin tuna in the net at "rings up"¹⁸. After "rings up," the AR-2 entered the net. When the half net marker came aboard the work deck, Bob Pitman and I entered the net with the ship's inflatable eight-foot dolphin rescue raft and pulled the raft along the corkline toward the dolphins. When we got close to the dolphin aggregation, the raft was fastened to the corkline with a rope. We entered the water with snorkeling gear to make observations of the dolphin and the yellowfin tuna behavior inside the net prior to and during the bow ortza release maneuver.

Bow ortza release procedure:

In order to facilitate the bow ortza release there were no bow-bunches¹⁹ pulled during the set. Since bow-bunches were not pulled there was considerably more than the normal amount of large (4.25") webbing in the water on the bow side of the net. The large webbing in this section of the net forms the sack.²⁰ The sack is tapered and tends to balloon when water flows through it. As the bow ortza was released, the remaining rings were dropped into the water and the cable connected to the bow ortza was slowly let out. The fishing master shifted the engine into reverse to move the ship backwards while he continued to roll the net. The bow ortza release maneuver was performed perfectly. A large opening developed between the port side of the tuna purse-seine vessel and the end of the bow ortza. Bob Pitman and I were positioned in the eight-foot inflatable dolphin rescue raft close to but not at the apex of what remained of the backdown channel corkline. The bow ortza and about 50 meters of corkline were underwater and the net was opening as anticipated. The dolphin school was milling at the surface near the opening between the port side of the purse-seiner and the submerged cable connected to the bow ortza. When the dolphins were milling at the surface we started splashing the water to herd the dolphins out of the opening formed between the ship and the net during the bow ortza release procedure. The dolphins disappeared below the surface and swam under our raft and

¹⁸A point in the set sequence when the rings through which the purse cable runs are hauled up along the side of the seiner signalling the closing of the bottom of the purse seine.

¹⁹A bow-bunch is created when a rope which is threaded through a series of small rings attached to the corkline is pulled and the rope bunches a length of corkline together. Bow-bunches are located on the bow end of the net and are secured to cleats on the bow. They help to align the porpoise safety panel and provide added flotation for large catches.

²⁰The portion of the net used to concentrate the catch and raise it to the surface for loading. It is constructed of heavier and stronger twine in order to withstand the weight of large catches.

reappeared at the surface near the corkline. Several dolphins came to surface inside a net canopy and became entangled by their beaks in the 4.25" sack webbing. The dolphins started struggling so Armstrong, Pitman, Lindsay, and Scott entered the water, dove under the net canopy and started hand-releasing dolphins over the corkline. Several crewmen entered the water and assisted with dolphin release. After we finished releasing all the dolphins we could safely rescue from the net, we got into the eight-foot inflatable dolphin rescue raft and were towed by speedboat to the NICOLE K.

The net that remained in the water after the ortza release procedure was rolled on board. There was no need to sack-up²¹ the net because most of the fish had escaped during the ortza release. There were six dead yellowfin tuna, one live smooth-tailed mobula, *Mobula lucasana*, and two dead female spotted dolphins (one fused and one mottled), rolled aboard in the pocket of net that was formed near the bow ortza. All dolphin and tuna specimens were processed according to standard NMFS cetacean life history and IATTC food habits sampling protocols. Heads and dorsal fins were also collected from the dolphins. After the animals were processed, arrangements were made to have a speedboat driver take the scientific field party to the McARTHUR so strategies for the next set could be discussed with the chief scientist and members of the scientific field party aboard the McARTHUR.

The meeting was convened in the McARTHUR's wardroom. Michael Scott, Bob Olson, Kim Holland, Wes Armstrong, Bob Pitman, and Rick Lindsay attended the meeting. The discussion focused on what had been learned during Set 1. It was the consensus of the group that several factors were likely contributors to the failure of the simultaneous release of dolphins and tuna using the bow ortza release procedure.

1. Spotted dolphins inhabiting the study area were frequently captured and released by tuna purse-seine fishing vessels and were conditioned to the "normal" backdown procedure. During a normal backdown procedure the dolphins move toward the apex of the backdown channel. The corkline is pulled underneath them. They spill out of the net or are hand-released by crewmen over the corkline at the apex of the backdown channel. During the bow ortza release maneuver the captured dolphins moved to the area where the apex of the backdown channel would normally have been located. They encountered a very large net canopy. The dolphins panicked when they surfaced inside the canopy and became entangled.

2. The noise generated by the main engine, generators, hydraulic pumps, etc., probably contributed to the dolphins reluctance to move toward the vessel and out of the opening formed between the vessel and the end of the net during the bow ortza

²¹The process of reducing the volume of the sack webbing to concentrate the fish near the surface.

release procedure.

3. If the inflatable rescue raft had been located at the apex of the corkline, it is possible that the dolphins would not have moved to the canopy area and might have gone out between the bow ortza and the ship as most of the fish did.

4. It is possible that diffuse light (sundown) and the resultant reduced visibility during bow ortza release contributed to the entanglement of the dolphins.

It was the opinion of the participants at the meeting that it would be more effective to tag tunas and dolphins and have the fishing master backdown hard to release the dolphins and tuna simultaneously from the net. This method of release seemed to pose less of a threat to the captured dolphins because the fishing crew and the dolphins were familiar with the backdown maneuver. The vessels drifted all night.

10 November 1992

Search effort started at 06:20. The starting position was 8°29'N and 85°58'W. Two silky sharks, *Carcharhinus falciformis*, were caught by a crewman with a shark handline the previous night and were processed by David Au. The shark stomachs were empty so they were not collected.

Helicopter Flight #1:

1. Five large schools of "whitebellies" were located by the fishing master. He estimated the school sizes ranged from 1000-2500 animals. None of the schools were carrying tuna.

2. One school of "whitebellies" was reported by the fish spotter in the crow's nest. No estimate of school size was given. One "man of war" was reported to be associated with the school. The bird was picked up by the bird radar.

Helicopter flight #2:

1. One large school of "whitebellies" was reported by the fishing master. Scattered tuna were observed associated with the dolphins.

2. The fishing master located 10-15 sperm whales, *Physeter macrocephalus*. Two pairs were observed copulating by Capt. Madruga from the helicopter. He also observed individuals coming up from very deep and breaching at the surface.

3. A large school of "black porpoise without beaks" was reported by the fishing master. The school was located directly in front of the vessel so we were able to look at the animals. They were positively identified as melon-headed whales, *Peponocephala electra*, by the scientific field party members. The NICOLE K made several passes near the school to photograph them.

4. The fish spotter in the crow's nest reported a flock of birds ahead of the ship and sent the helicopter to inspect the area for dolphins and tuna. The helicopter reported a school of "whitebellies" which were later identified as common dolphins by the scientific field party.

Search effort ended at 16:55. The fishing master suggested that the ships should continue to travel west in order to get away from the green water, and the schools of "whitebellies." This information was passed to the chief scientist.

11 November 1992

Search effort started at 06:00. The starting position was 10°21'N and 89°58'W. The fish spotter in the crow's nest located a bird flock with dolphins underneath it at 07:20. The helicopter was deployed and Capt. Madruga checked the school. The fishing master reported an estimated 300-400 spotted dolphins carrying yellowfin tuna. I relayed the information to Michael Scott and Cmdr. Peterson so they could assess the sea conditions and determine whether or not to attempt a set. I was instructed to ask Capt. Madruga to make a set on the tuna/dolphin aggregation and to get prepared for tagging and tracking operations.

Set No. 2

The net was deployed for Set 2 at 08:25. The set position was 10°21'N and 89°58'W. The vessel set on an estimated 300-400 northern offshore spotted dolphins. The purse-seine encircled approximately 45-50 spotted dolphins and an estimated 10-12 tons of yellowfin tuna. When the towline was almost entirely rolled in, the MCARTHUR's bridge watch was contacted to notify them it was safe for the scientists aboard the AR-2 to come inside the net to start fishing for tuna with handlines. After the MCARTHUR deployed the AR-2, the launch driver was instructed to enter the net near the 1/2 net buoy so the wind would be on the launch's stern when it entered the net. The wind would push the launch inside the net if the engine failed. The tuna tagging team was advised to be careful that their activities inside the net did not push the dolphins toward the net roll area or toward the purse-seine vessel.

The AR-2 entered the net at approximately 09:30 and the tuna tagging team started handline fishing for tuna. After fishing for approximately ten minutes, the AR-2's driver attempted to reposition the boat by backing up against the swell and wind. This maneuver turned out to be a mistake because the Beaufort sea state had increased to 4, and a heavy chop had developed inside the net. The AR-2 started taking on water over the stern transom. The people on board the AR-2 scrambled to the stern and started bailing out water. The increased weight in the stern of the vessel caused more water to flow in over the transom and this was when the launch started sinking. The stern went down first and the bow stood up in the air as the occupants jumped out of the AR-2 with whatever equipment they could grab. The AR-2 rolled over and floated upside down. No one was injured in the incident.

When Capt. Madruga saw what was going to happen to the AR-2 he called one of the NICOLE K's speedboat drivers on the radio, and

directed him inside the net to assist the people in the water. Two crewman from the NICOLE K entered the water and brought a line to the AR-2 so it could be pulled to the port side of the purse-seine vessel. Swimmers collected the articles of equipment that were floating in the water and passed them up to crew on the ship. Cmdr. Peterson was contacted to report the situation was under control and no one had been injured. Crew members used the ship's electric single winches to hoist the AR-2 aboard the work deck.

When all the floating gear was recovered from the water, Capt. Madruga rolled the net to the tie down point, and a standard backdown maneuver was performed. After backdown, the remainder of the net was rolled aboard the ship and sacked up. Phil Peterman estimated 12 tons of yellowfin tuna were brailled and loaded into a fish well. The size of the tuna ranged from 30-80 lbs. Armstrong, Au, Lindsay, and Pitman processed 23 yellowfin tuna at the end of the set. The fork length, sex, and stomach contents were recorded for each sampled tuna (Table 2). Underwater video footage was recorded of dolphins inside the net.

After the set was completed, the chief scientist, fishing master, and I discussed the possibility of trying a different approach to catching tuna to be tagged inside the purse-seine net. We proposed to pick up the tuna handline fishing and tagging team at the McARTHUR in one of the NICOLE K's speedboats and transport them inside the net. They could fish from the speedboat or the speedboat could tow them in an inflatable raft within the confines of the purse-seine. A second proposal was to attempt to tag tuna's with a lance prior to backdown. Swimmers had reported the tuna were tightly grouped and located near the surface just prior to backdown and thus vulnerable to lance-tagging.

The NICOLE K's assistant engineer and a member of the engineering department from the McARTHUR flushed the salt water out of the AR-2's twin seventy horse-power engines and got them running on the work deck of the NICOLE K. Sea conditions were too rough to tow the AR-2 to the McARTHUR so it remained on the work deck. The NICOLE K's assistant engineer injured his knee in the speedboat when he returned from delivering the Michael Scott to the McARTHUR. The McARTHUR's medical technician was contacted to report the knee injury and to request advice on treatment.

At 17:00 a large flock of seabirds was located by the fish spotter in the crow's nest. The ship headed toward the bird flock. It was determined that the seabirds were working over a school of spotted dolphins. Capt. Madruga stopped the boat because it was too late in the day to make a set. I received the weekly fuel log data from Phil Peterman in the evening and the NICOLE K drifted all night.

Sighting summary:

1. One small school of bottlenose dolphins, *Tursiops truncatus*, were sighted riding the NICOLE K's the bow wave, and two

schools of spotted dolphins were located from the helicopter. Neither school of spotted dolphins was suitable for making a set because the dolphins were very widely scattered. The AR-2 was delivered to the McARTHUR in the afternoon.

12 November 1992

Started search effort at 06:15 and the starting position was 10°48'N and 91°30'W. At first light the McARTHUR and the NICOLE K were 14 miles apart. Four bottlenose dolphins were observed riding the bow wake of the ship at 08:15.

Helicopter flight #1:

1. The fishing master reported a school of an estimated 15 "whitebellies" at 09:17.

2. The fishing master reported a school of dolphins, but no school size estimate was provided at 09:25.

3. The fish spotter in the crow's nest located a school of spotted dolphins at 10:23. The helicopter travelled to inspect the school and the fishing master reported an estimated 150-200 spotters and no fish. After the helicopter returned to the ship, the fishing master directed the deployment and subsequent return of the AR-2 to the McARTHUR. The McARTHUR's medical technician was asked to come to the NICOLE K by speedboat to examine the assistant engineer's injured knee.

Helicopter flight #2:

1. No sightings of dolphins were reported during the flight. An olive ridley sea turtle was observed from the ship at 12:45. The helicopter returned to the ship at 12:53 and the medical technician was returned to the McARTHUR by speedboat at 13:10.

Helicopter flight #3:

1. No sightings of dolphins were reported during the flight.

13 November 1992

Search effort started at 06:15 and the vessels position was 9°37'N and 94°54'W at 07:15. Cmdr. Peterson and Michael Scott had gauged sea conditions and reported that conditions were suitable to conduct tagging/tracking operations.

Helicopter flight # 1:

1. Three sightings of "whitebellies" were reported by the fishing master.

2. At 09:00 the NICOLE K inspected a piece of floating foam for associated tuna. When the vessel passed within a few meters of the flotsam, the SIMRAD echo sounder was turned on. No subsurface fish were detected by the echo sounder.

Later in the morning (11:00), the Beaufort sea state changed to 0 and several sea turtles were sighted from the ship. I asked the

fishing master to deploy a speedboat. Pitman, Armstrong, and a speedboat driver, headed to the area where an olive ridley sea turtle had been sighted. Unfortunately it disappeared below the surface before we could get close enough in the speedboat to capture it, but the fish spotter in the crow's nest located another turtle close to the ship. We approached the turtle at high speed until the speedboat was almost on top of it. I was crouched on the starboard rail and when the speedboat throttled down, I jumped into the water and landed near the back of the turtle. I grasped the turtle by it's carapace, near the nuchal scute and the most posterior marginal scute, and pointed it's head toward the surface so it could not dive. The turtle was brought close to the side of the speedboat so Pitman could pull it up and into the speedboat. This specimen was brought to the NICOLE K to be processed and was subsequently released unharmed. The deployment, capture, and return of the speedboat to the ship took approximately 15 minutes. The data collected was recorded on sea turtle life history form #057 (Table 9 and APPENDIX IV).

The NICOLE K passed through a concentration of olive ridley sea turtles at 11:25. Since sea conditions were perfect for sighting turtles (Beaufort 0) and for operating a speedboat while the NICOLE K remained in search mode. A speedboat was deployed with Pitman, Armstrong and a driver aboard. We captured three olive ridley sea turtles (sighted from the vessel and from the speedboat). They were measured, sexed, tagged and released from the speedboat. The operation lasted one hour and we processed one female, and one juvenile (unidentified sex), and one male olive ridley sea turtles and recorded the data on sea turtle life history forms #058, #059, and #060 (Table 9 and APPENDIX IV). The sea turtle capture operation did not interfere with marine mammal sighting effort.

Helicopter flight #2:

1. Three sightings of "whitebellies" were reported by the fishing master.
2. Two sightings of striped dolphins were made by members of the scientific field party.

The ship ended search effort and started drifting at 17:50. Capt. Madruga listened to his code group's daily catch and weather information in order to provide input concerning the upcoming day's fishing strategy. The fishing master suggested drifting during the night and searching to the southwest in the morning. I relayed this information to Michael Scott and Cmdr. Peterson.

14 November 1992

Search effort started at 05:50 and the position was 7°41'N and 95°29'W. At 07:15 the fish spotter in the crow's nest reported a school of dolphins on the bow.

Helicopter flight #1:

The helicopter was deployed at 07:25 to check the school of dolphins located from the crow's nest.

1. Capt. Madruga reported an estimated 100 spotted dolphins carrying a few tons of yellowfin tuna. I contacted Michael Scott to ask if he was interested in trying to work this tuna-dolphin aggregation. He asked Capt. Madruga to attempt to make a set on the school. The chase commenced at 07:40 when the speedboats were launched, and it continued until 08:23 when they were called back to the purse-seine vessel. The fishing master was unable to make the dolphin school herd together. They kept spreading apart and dispersing into small subgroups during the chase. The chase was called off and the search effort was resumed after the speedboats were picked up by the NICOLE K.

The helicopter landed to refuel and it resumed flying at 08:30. The fishing master reported a school of "whitebellies" at 09:15. The fish spotter in the crow's nest located a flock of birds working over the water at 10:15. The helicopter was directed to the bird flock and after assessing the school Capt. Madruga reported an estimated 200-300 spotted dolphins. The NICOLE K turned and headed toward the school at full speed. Shortly after these dolphins were reported from the helicopter, the McARTHUR's observers reported a flock of birds and possibly dolphins (splashes) off their starboard bow. The McARTHUR's bridge watch was contacted and asked to instruct the scientists looking through the high power glasses to keep track of the birds. They were cautioned to maintain a buffer of two to three miles between the ship and the bird flock/dolphin school because it might be necessary to try to chase that aggregation if the school we were planning to chase and make a set on was unworkable. The helicopter returned to the purse-seine vessel at 10:20 to refuel. The McARTHUR was contacted to determine if sea conditions were suitable to deploy tracking launches and conduct tagging operations inside the net. Michael Scott and Cmdr. Peterson gave permission to set on the spotted dolphin school the helicopter had assessed at 10:30. The helicopter was deployed and it flew toward the tuna/dolphin aggregation. Shortly after the helicopter departed, the speedboats were deployed. The fishing master ordered the speedboats to follow behind the tuna purse-seine vessel.

At 11:05 Capt. Madruga directed the speedboat drivers to chase the dolphin school located in front of the NICOLE K. The tuna purse-seine vessel and five speedboats chased the dolphin school for approximately ten minutes. The dolphin school disappeared below the surface so Capt. Madruga called off the chase and the speedboats returned to the ship and were picked up. The fishing master determined the dolphin school was unworkable. He could not make the dolphins located at the front of the school turn left inside the circle being created by the speedboats and the prop-wash generated by the NICOLE K.

The McARTHUR was contacted at 11:25 to ask the bridge watch to

direct the helicopter to the spotted dolphin school they were following. Capt. Madruga reported the school contained an estimated 300 spotted dolphins and was carrying approximately 10-15 tons of yellowfin tuna. Most of the tuna were following the 30 dolphins located at the front of the school. Five speedboats were deployed and were directed toward the dolphin school by the fishing master. Scientific field party members on both vessels were notified to prepare for tagging and tracking operations.

Set No. 3

Set 3 was made on an estimated 100-150 northern offshore spotted dolphins. Capt. Madruga made a bow ortza to stern ortza (no towline had to be released) set. The net was deployed at 12:38 and the set position was 7°19'N and 96°13'W. As soon as the purse-seine vessel met the skiff, Michael Scott was called and informed that it was safe for the tuna tagging team to enter the net when they were ready to start handline fishing for tuna. The AR-1 was deployed, but it had an engine malfunction and was drifting dead in the water. The AR-1 was contacted on VHF radio to ask if they needed assistance. The chief scientist requested a tow so Capt. Madruga sent a speedboat to assist them. Eventually the AR-1's driver got the engine started and the AR-1 was able to enter the net without any assistance.

As soon as the AR-1 was inside the net, Rick Lindsay deployed the inflatable eight-foot raft and he paddled to the AR-1 to pick up Michael Scott. The McARTHUR deployed one of the tracking launches (AR-4). The scientists and crew aboard the AR-4 spent a few minutes setting up the radio-tracking antennas. They were contacted by VHF radio to make arrangements to pick up the eight-foot and twelve-foot inflatable rafts to be used during tagging operations. Both rafts were tossed overboard on the starboard side of the purse-seine vessel. They were retrieved with boat hooks by the personnel aboard the AR-4. The AR-4 was instructed to proceed to the corkline on the stern side of the apex of the Porpoise Safety Panel²² (PSP) and wait for instructions from Michael Scott.

The tuna tagging team continued handline fishing efforts inside the net. The net started to collapse near the apex of the PSP so Capt. Madruga ordered two speedboats to attach lines to the corkline and start towing. Capt. Madruga told me if he could roll some net it would give him more control of the net that remained in the water. I told him to do whatever in his judgement was necessary to keep the net open and prevent dolphin mortality.

²²A section of net that is two strips deep (12 fathoms), constructed of 1.25" mesh, up to 180 fathoms long. It is designed to cover the perimeter of the backdown channel and to reduce the likelihood of marine mammal entanglement.

At this point in the set sequence no one including the fishing master had seen much tuna in the net. The chief scientist requested swimmers to enter the net to help determine if there were tuna captured during the set. Armstrong, Au, Pitman, and two crewmen entered the net with snorkeling gear. A crew member swimming in the net reported to Michael Scott that he observed eight tons of tuna inside the net. Observations by swimmers indicated that the tuna were swimming very deep and were located directly underneath the dolphins. The tuna were frequently out of visual range of swimmers and far below the baited hooks being used by tuna handline fishermen. Handline fishing effort continued without success. The AR-4 positioned itself near the corkline on the bow side of the apex of the PSP where the chief scientist's eight-foot inflatable raft was tethered to the corkline. The twelve and eight-foot inflatable rafts were deployed from the AR-4. The dolphin tagging team personnel climbed aboard the rafts with their equipment and tethered their rafts to the corkline and prepared for tagging operations.

Michael Scott instructed Capt. Madruga to roll the net to the 1/2 net marker. Although no tuna had been captured and tagged, he decided to attempt to capture and tag a dolphin. His intent was attach a time-depth-recorder/radio-transmitter tag to a dolphin, release it, and track the dolphin school overnight and attempt to recapture the dolphin in the morning. A fused male northern offshore spotted dolphin was captured and delivered to the dolphin tagging station by swimmers. There was some confusion initially between the swimmers and personnel in the tagging raft concerning how to position the captured dolphin in the raft for tag attachment. The chief scientist did not have a VHF radio in the raft so he could not communicate directly with the fishing master. There was a lot of shouting and hand signals being used to communicate between the rafts inside the net and Capt. Madruga. The lack of direct communication between Michael Scott and Capt. Madruga contributed to the unwanted start of the backdown process. When backdown began, dolphins started to get entangled at the apex of the backdown channel so swimmers abandoned the dolphin tagging station and moved to the apex of the backdown channel to hand release dolphins. The tagging operation was aborted and the captured dolphin was released. The dolphins were all released alive during backdown.

The tuna remained in the net after backdown and provided an opportunity for scientific field party members to make observations of tuna behavior inside the net. Scientists Armstrong, Pitman and Olson remained in the net after backdown. During backdown some of the bait being used by handline fishermen had accumulated at the apex of the PSP. It was collected by the swimmers and furnished an opportunity to observe tuna response to the bait being used on handlines inside the net. Several pieces of sardines were released in the water at the same depth the tuna were swimming during their forays up and down the net. The fish swam past the bait on three

or four passes. Their behavior did not indicate any interest in the bait. Several individuals were observed maneuvering to avoid the floating bait in their path. These observations were made when the net area was considerably restricted.

An estimated 10-12 tons of yellowfin tuna were brailed aboard and loaded in a fish well. The scientific field party processed 30 yellowfin tuna (Table 3). Two blue sharks, *Prionace glauca*, were caught on shark handlines by a crewman when the vessel drifted. One shark was dead and it was processed by David Au and the other was alive so it was released.

At the end of the day I called Michael Scott to ask if he wanted to get together to discuss what we learned during Set 3. He felt it would be easier to communicate our ideas over the radio. The following points were discussed:

1. Chief scientist should have a VHF radio with him in the raft so he can communicate with Capt. Madruga. He decided he would no longer be directly involved with tagging process and he would act as the coordinator of all activities inside the purse-seine net and assist as needed.

2. He suggested that dolphin tagging procedures should be initiated earlier in the set when there was still a fair amount of net in the water. He will signal me when he feels that handline fishermen have had enough time to catch and tag fish so swimmers can enter the water to acclimate the dolphins to their presence inside the net.

3. The chief scientist should be the only person to instruct the fishing master when he is ready for the backdown maneuver to start.

4. If Rick Lindsay is slated to go up in the helicopter to aid tracking efforts, he must get aboard the NICOLE K prior to backdown or someone else will have to accompany the helicopter.

5. I relayed information from Capt. Madruga to Michael Scott that the backdown channel can be kept open with speedboats for a prolonged time period as long as the ship keeps the wind off the port stern quarter. When the ship and the wind are in that configuration, the net skiff can keep the purse-seine vessel and the net in proper position to keep the backdown channel open indefinitely. Two speedboats can attach to the corkline near the apex and tow to keep the backdown channel from collapsing on itself. If the wind swings around to the starboard side of the ship, it has a tendency to push the purse-seine vessel into the net despite the towing by the net skiff. This can create net canopies which tend to increase the likelihood of dolphin mortalities. Direct communication between the chief scientist and the fishing master should prevent these types of situations from occurring or at least allow for swift reaction to circumstances that are potentially dangerous for the dolphins in the net.

6. I suggested a buffer of 2.5-3.0 miles between the McARTHUR and the dolphin schools especially if birds are associated with dolphins and/or if the dolphins are identified as spotted dolphins.

The buffer should help to prevent the ship from causing the dolphin school to spread apart and become unworkable.

Sighting Summary:

1. One school of "whitebellies" was reported by the fishing master from the helicopter.

2. Two schools of spotted dolphins were sighted from the NICOLE K and one school of spotted dolphins was located by the observers aboard the McARTHUR. All three schools of spotted dolphins were chased.

15 November 1992

Search effort started at 06:30 and the starting position was 7°26'N and 96°15'W. A large swell had developed from the north and a light breeze was blowing. The Beaufort sea state was 4. Conditions were not suitable to deploy tracking launches.

Helicopter flight #1:

The helicopter departed at 08:30 and at 09:25 Capt. Madruga called the NICOLE K from the helicopter and reported an engine malfunction. He ordered the ship to head toward him at full speed. I contacted Cmdr. Peterson to provide a distance and bearing (18 miles and 250°) to the helicopter. His ship was requested to proceed full speed toward the helicopter. As soon as the helicopter was picked up on radar, its return was plotted to reduce the potential search area in the event that it went down. At 09:45 the helicopter landed safely on the ship. The helicopter pilot and mechanic reported that the malfunction was most likely caused by water in the fuel.

Helicopter flight #2:

At 11:10 the helicopter mechanic and pilot conducted a test flight to check the helicopter's engine to determine if the mechanical problem encountered during flight #1 (engine missing and vibrating) was repaired. During the test flight, they inspected a school of spotted dolphins that was initially sighted from the ship at 10:10. The helicopter pilot estimated 400-500 spotted dolphins in the school and he reported seeing a few tons of tuna associated with the dolphins.

Michael Scott was contacted to determine if the NICOLE K should make a set to conduct ancillary research projects because sea conditions were too rough to deploy/recover tracking and support launches from the McARTHUR. He opted to keep the ships heading for better sea conditions. As the day progressed, the swells increased in size and were originating from at least two directions. Search effort was terminated and Michael Scott had the McARTHUR assume a comfortable course into the swell. We travelled parallel to their course for the balance of the day and the NICOLE K stopped and drifted at 17:47.

16 November 1992

The morning position was 6°40'N and 97°09'W at 06:00. In the morning, the swell was coming from two directions and the dominant swell was originating from the north. Heavy rain showers were present and were encountered throughout the day. The size of the swell and the wind speed had decreased somewhat compared to the previous day, but the sea conditions were still not suitable for conducting tagging and tracking operations. Capt. Madruga's code group reported rough weather all around the study area. We drifted all day and night. Crewmen caught several pelagic whitetipped sharks, *Carcharhinus longimanus*, and one silky shark on shark handlines. David Au measured, sexed, and examined the stomach contents of all specimens. Pitman dipnetted in the evening and collected several bags of flying fish and porcupine fish for the tuna tagging team to use as bait during handline fishing operations inside the net.

17 November 1992

Search effort was started at 06:30 and the starting position was 6°47'N and 97°39'W. The NICOLE K had drifted approximately 35 miles since it stopped on 15 November 1992. At 07:30 Cmdr. Peterson contacted the NICOLE K and stated that he could not launch the tracking launches from his ship due to the presence of the confused swell. I proposed that we could provide the NICOLE K's speedboats to act as shuttles for tagging personnel and they could be used inside the net to catch fish if an opportunity to make a set occurred. The tracking of dolphins could be conducted from the McARTHUR and/or the NICOLE K; however, tracking sonic-tagged tuna would not be possible without the 27-foot tracking launches equipped with underwater hydrophones. Michael Scott indicated this was a good back-up to standard operating procedures.

Helicopter flight #1:

At 07:55 the fish spotter in the crow's nest located a flock of birds working over a school of dolphins. The helicopter departed to check the school reported by the crewman in the crow's nest at 08:10.

1. The fishing master reported an estimated 400-500 "whitebellies."

2. The fishing master reported an estimated 50 "whitebellies" at 09:10. The helicopter landed at 09:30.

The Beaufort sea state steadily diminished during the day. By afternoon the Beaufort sea state fluctuated between 0-2, but a confused swell from two directions persisted. The confused swell prohibited the McARTHUR from being capable of deploying/recovering its tracking launches. No additional dolphin schools were located during the remainder of the day. At approximately 15:15, the vessel passed through a cluster of sea turtles. The Beaufort sea state was 0. The deck boss was asked to deploy a speedboat. Bob

Pitman and I captured, tagged, and measured one male olive ridley sea turtle. The data was recorded on sea turtle life history form #61 (Table 9 and APPENDIX IV). After processing the turtle, the speedboat remained in the water and followed the ship looking for additional turtles while the NICOLE K continued search effort. We hoped to be directed to other turtles located by the personnel aboard the ship, but no additional sea turtles were sighted. Turtle operations were concluded and the speedboat and personnel returned to the ship at 16:30. Dolphin search effort ended at 17:00. The vessel's position at the end of search effort was 7°35'N and 97°51'W.

I received a FAX from Chuck Oliver at SWFSC that documented a change in the charter contract concerning government employees being allowed to embark on the ship's helicopter as passengers/observers at no additional cost to the contract. Sent a speedboat to the McARTHUR to deliver flying fish, porcupine fish, and a copy of the FAX from SWFSC to Michael Scott. The ships ran all night.

18 November 1992

Capt. Madruga stopped the ship at 05:30 and drifted. Search effort was started at 06:35 and the starting position was 9°00'N and 99°00'W. At daybreak the two ships were within three miles of each other. I contacted the McARTHUR's bridge watch and requested them to steer a heading that would spread the two vessels spread apart by at least 5-7 miles. Michael Scott ordered the ships to change their heading to 360° when they reached the 100°W longitude line.

Helicopter flight #1:

The helicopter departed at 07:30 on the first flight of the day. Cmdr. Peterson called to report he considered the current sea conditions to be suitable for deploying/recovering the tracking launches. At 08:20 Capt. Madruga located a mixed school of "spotters and spinners." He estimated the dolphin school was carrying approximately three tons of tuna. The McARTHUR's bridge watch was called to direct them toward the school in case the fishing master determined there was enough fish to make a set. The helicopter returned to the boat and refueled at 09:35. The speedboats were launched and instructed to follow the purse-seine vessel. When the NICOLE K was within 2 miles of the school, Capt. Madruga directed the speedboats to chase the school. He never observed more than three tons of tuna associated with the dolphins during the chase. The chase was called off at 10:30, the speedboats were picked up, and the helicopter landed on the vessel. After the chase was called off, Michael Scott directed both ships to head north.

Helicopter flight #2:

The helicopter departed at 12:20. The McARTHUR's observers located a school of dolphins at 13:30 and called the helicopter to direct

it toward the school. Capt. Madruga located the dolphins and reported they were "whitebellies." At 13:37 the fishing master located a school of an estimated 250 "spinners." There were not any seabirds or yellowfin tuna associated with the dolphins. The helicopter landed at 14:45. The ship stopped at 17:20 and drifted all night.

Michael Scott was called at 20:00 to relay information about where and how the NICOLE K's fishing code group was doing. The fishing master's information indicated that the area from the 10-12°N latitude and 102-105°W longitude might be worth checking because historically they had been good producing areas at this time of the year. After consulting weather data collected for the study area for the past 20 years, dolphin survey data from MOPS cruises, and NMFS/IATTC tuna-dolphin observer set data, Michael Scott concluded that the ships should travel northeast from their current position.

19 November 1992

The vessel started search effort at 06:30 and the starting position was 10°06'N and 100°19'W. Two pelagic whitetipped sharks were caught on shark handline gear by a crew member. The sharks were processed by David Au (empty stomachs). The McARTHUR'S bridge watch was contacted to suggest they should move at least 7-10 miles off the NICOLE K's starboard beam so the vessels search tracks would cover more area.

Helicopter flight #1:

The helicopter departed at 07:35 and started search effort. At 08:35 a school of an estimated 30-50 spotted dolphins was observed passing approximately 1/10 of a mile in front of the NICOLE K. The McARTHUR's observers located a school of spotted dolphins at 08:36. They reported seeing tuna jumping close to the dolphin school and a flock of seabirds were diving into the water and feeding near the tuna and dolphins. The helicopter was directed to check the school and the NICOLE K turned and headed toward the McARTHUR at full speed. The vessels were about 11 miles apart. Capt. Madruga reported seeing an estimated 100 spotted dolphins with "scattered backs" and some "deep shiners" (terms used to describe the relative abundance of yellowfin tuna present in a school). He reported the dolphin school was following the tuna. The helicopter landed and refueled at 09:25. Capt. Madruga indicated that the dolphin school was worth setting on if sea conditions were appropriate for launching and recovering the tracking launches. Cmdr. Peterson was called to inquire if the sea conditions were suitable for launching his tracking launches. He gave permission to attempt to set on the tuna/dolphin aggregation. At 09:50 the speedboats were deployed and the helicopter departed and traveled toward the tuna/dolphin association.

Set No. 4

The purse-seine net was deployed at 10:10 and the set position was 9°52'N and 99°57'W. When the school was encircled, the MCARTHUR's bridge watch was instructed to have the scientific field party get prepared for tagging and tracking operations. Immediately following the deployment of the MCARTHUR's launches, each vessel was called on VHF to verify that radio communications were possible with each boat. The AR-1 arrived at the purse-seine vessel first. It delivered Marco García who was the IATTC scientist slated to assist tracking efforts from the helicopter. After dropping off Marco, the AR-1 exited the net and re-entered at 10:55. The exit and immediate reentry into the net was done to standardize the start of tuna handline fishing effort for each set. The handline fishing effort started at 10:58. At 11:15 the AR-4 was contacted and directed into position (next to the corkline close to the orange buoy on the stern side of the apex of the PSP) to deploy rafts and dolphin tagging personnel.

Handline fishing effort for tuna continued as the net was slowly rolled aboard. The net rolling process helped to orient the tuna purse-seine vessel with the wind on it's port side. The other tracking launch (AR-3) was deployed, and it moved to a stand-by position outside the PSP corkline. Rick Lindsay entered the net with the inflatable eight-foot raft, and moved toward the fishermen in the AR-1 to pick up Michael Scott. The AR-1 was called to confirm that radio communications were possible between Michael Scott, Bill Madruga, and myself.

When the 1/2 net marker was rolled aboard Pitman, Armstrong, Au, and two crewmen entered the water with snorkel gear and moved toward the school of dolphins. Michael Scott instructed the swimmers to capture a dolphin and deliver it to the tagging team. After several unsuccessful attempts to capture a dolphin, a fused female northern offshore spotted dolphin (D1) was captured and transferred to the tagging team. A time-depth recorder/radio-transmitter (tuned to 148.260 MHz) was attached to the dorsal fin of the captured dolphin. After tagging procedures were concluded, D1 was released into the net. It was pushed to the surface for its first respiration and it swam away under its own power. Swimmers observed D1 shortly after tagging and it was associated with other dolphins inside the net and it appeared to be behaving normally. No tuna were caught or tagged by handline fishermen during the set. All of the dolphins and approximately half of the fish were backed out of the net.

The tracking launches (AR-4, AR-3) were receiving D1's radio-transmitter signal prior to backdown and initiated tracking of the radio-tagged dolphin immediately following dolphin release during the backdown procedure. The helicopter departed after backdown was completed to assist with tracking efforts. The IATTC scientist in the helicopter could not get the ATS to function properly. It was not indicating a direction so the helicopter landed at 14:00. Phil Peterman and Rick Lindsay disassembled the ATS to inspect it for

loose wires. They could not determine the cause of the malfunction. A few tons of tuna remained in the net after backdown and it was brought aboard the purse-seiner in the small bag of webbing formed near the bow ortza. Twenty-two yellowfin tuna were processed by Armstrong, Au, Pitman and Lindsay after the set was completed (Table 4). The cause of the ATS malfunction in the helicopter was the result of a disconnected cable. It was reconnected and the helicopter's ATS functioned properly thereafter.

When Set 4 was completed the NICOLE K assumed a stand-by status and drifted. The scientific field party and the fishing crew were prepared to assist during tracking operations. The vessel monitored the McARTHUR's house radio frequency (164.025 MHz) and channels 13 and 16 on the VHF radio. The McARTHUR's bridge watch was informed that if they needed our assistance with tracking operations to instruct the NICOLE K's bridge watch to call me to coordinate activities on the purse-seiner. During the evening tracking effort the tracking launches were up to 14 miles from the NICOLE K. Capt. Madruga closed the gap between the ships and drifted for the remainder of the night.

After dinner, a weekly summary of the research activities conducted aboard NICOLE K was delivered to the McARTHUR by speedboat. Bob Pitman and I met with Kim Holland and Bob Olson in the wardroom to offer some alternative ideas for catching tuna inside the net that had been discussed with Capt. Madruga and the crew. We also conveyed a report of dolphins eating chum in the net by one of the crewmen who assisted with dolphin capture. We suggested it might be enlightening for the handline fishermen to allow Bob to watch fishing operations from the water and have him report how tuna reacted to their handline gear and various baits.

20 November 1992

The NICOLE K moved toward the McARTHUR and the tracking launches at 06:30. The vessels position was 9°42'N and 99°46'W. Michael Scott requested a helicopter deployment as soon as the sun was high enough in the sky to provide good visibility. He wanted Capt. Madruga to check the school and determine the number of dolphins and amount of tuna associated with D1.

Helicopter flight #1:

The AR-3 was tracking D1 and the associated dolphin school when the helicopter was deployed at 07:18. The helicopter travelled directly toward the AR-3 to inspect the school. At 07:35 Capt. Madruga reported he had located D1 from the air (the instrument package on the dorsal fin was visible from the air). He reported D1 was lagging 100 meters behind the rest of the school. The distance between the helicopter's position over the dolphin school and the AR-3 was determined by using the radar and it was estimated to be 0.10 mile. This information was relayed to the scientific

field party aboard the AR-3.

Capt. Madruga reported he observed the dolphins at the surface for a short time and then they sank below surface for several minutes between respirations. This behavior made it difficult to keep track of the dolphin school's position from the air. In his opinion the dolphins were clearly making an effort to evade the pursuit of the tracking launch. His opinion was based on observations of the dolphins from the helicopter. He reported the dolphins were not travelling in one direction. Members of the dolphin school kept diving and reappearing at the surface oriented to the right or left of the course being steered by the tracking launch. Capt. Madruga requested the AR-3 to turn away from the school and slow down so he could determine if the dolphin school would remain at the surface longer without the tracking launch chasing them. The AR-3 turned away from the school and the dolphins started spending more time near the surface which made it easier for Capt. Madruga to direct the tuna purse-seine vessel into position to attempt a set.

Set No. 5: Skunk set²³

The purse-seine was deployed at 08:20 and the set position was 9°45'N and 99°35'W. Capt. Madruga made an attempt to set on D1's school which was composed of an estimated 10-12 spotted dolphins. All of the dolphins in the school evaded the set. They escaped prior to encirclement through the open area between the net skiff and the bow of purse-seine vessel. When the dolphins evaded the set, the helicopter remained aloft and reported their location to the tracking launch. The McARTHUR was contacted to inform the tracking team that the dolphins had evaded the set so they would resume tracking operations while the NICOLE K pursed, and rolled the net aboard. Capt. Madruga reported D1 was travelling 100 meters behind the rest of the school.

The distance between the helicopter's position over the dolphin school and the tracking launch was estimated on the radar to provide an estimate of distance from the dolphin school to the tracking launch. The average distance between the tracking launch and the dolphin school over a thirty-minute period was calculated. The distance ranged from 0.1-0.5 miles. Most of the time the tracking launch was within 0.2 miles of the dolphin school. Capt. Madruga reported from the helicopter, in his opinion, the dolphins were clearly avoiding the tracking launch. The tracking launch was contacted to suggest they should provide more space between the tracking launch and the dolphin school to allow the dolphins to assume a more normal travelling behavior. Personnel aboard the tracking vessel did not feel that the close pursuit by the tracking launches was modifying dolphin behavior. The helicopter landed at 09:00 and the net skiff was pulled aboard at 10:10. Capt. Madruga

²³A set in which no tuna are caught.

asked if he could wait until the sun was directly overhead before he attempted to make another set on the school so it would be easier to follow the dolphins from the air.

The sun was overhead at 12:05 and the helicopter was deployed. It headed toward the AR-3 which was tracking D1 and associated dolphins. Capt. Madruga reported twelve spotted dolphins were traveling together one-tenth of a mile ahead of the AR-3. The dolphins were at the surface for one minute and below the surface for 3 minutes. Capt. Madruga said he would attempt to set if he could see the dolphins but he would not set blind. In his judgement setting without seeing the dolphins was unjustified unless there was a chance to catch the tagged dolphin. This information was relayed to Michael Scott. D1 was 0.3 miles ahead of the AR-3 at 13:10. The speedboats were deployed and they were positioned along the starboard side of the NICOLE K until just prior to letting go of the net when Capt. Madruga ordered them to chase the dolphin school.

Set No. 6

The purse-seine was deployed at 13:29. Set position was 9°42'N and 99°19'W. The dolphin school almost evaded the set but was pushed back inside the net by circling speedboats. When the school was encircled, all of the dolphins that had been associated with D1 since Set No.4 were captured. Preparations were made by scientific field parties on both vessels to recapture D1 and to remove the TDR/radio transmitter package. The McARTHUR deployed the AR-1 and it entered the net and deposited Michael Scott inside the inflatable eight-foot raft occupied by Rick Lindsay. The AR-3 deployed the rafts and the tagging personnel at the PSP corkline. The tagging personnel tied their rafts to the corkline on the stern side of the PSP. The McARTHUR was contacted to report Capt. Madruga did not see any tuna associated with the dolphins prior to setting. Pitman and Armstrong entered the net with snorkeling gear at "rings-up" to look for tuna inside the net. During the search for tuna, D1 was video-taped surfacing and diving in the net among the other spotted dolphins.

The tuna tagging team was handline fishing inside the net. The swimmers reported to Michael Scott and the handline fishermen that there were no tuna visible in the net. The net was rolled to half net and swimmers initiated efforts to capture D1. While swimmers attempted to capture D1, another dolphin was observed eating bait dropped by the handline fishermen inside the net. After several unsuccessful attempts to capture D1, it was captured and delivered to the tagging personnel. The TDR/radio-transmitter package was quickly removed from the dorsal fin by the tagging team. D1 was photographed and released inside the net. Upon the release of D1, the Michael Scott called Capt. Madruga and instructed him to start the backdown procedure. The dolphins were all released alive, and personnel inside the net were picked up and delivered to their

ships. Several polkadot ribbonfish, *Desmodema polysticta*, and other unidentified ribbonfish were collected by swimmers in the apex of the backdown area.²⁴

After the set was completed and the skiff was aboard, the NICOLE K moved away from the MCARTHUR. A speedboat was used to deliver all of the lost handline gear recovered from the net, and several bags of flying fish dipnetted by Pitman during the previous several nights were transferred to the scientific field party on the MCARTHUR. The NICOLE K drifted all night. One pelagic whitetipped shark was caught by a crewman on a shark handline rig. David Au processed the specimen and recorded pertinent data. David Au's underwater light was deployed in the evening and he was disappointed with the results. Apparently it did not aggregate fish around the boat as he had hoped.

21 November 1992

Search effort started at 06:30 and the starting position was 9°34'N and 99°16'W. The Beaufort sea state was between 0 and 1 which was optimal sea conditions for tagging/tracking operations.

Helicopter flight #1:

The helicopter departed at 07:20.

1. At 07:30 one school of dolphins was sighted by observers on the MCARTHUR. They reported "whitebellied dolphins" (*Delphinus/Streakers?*).

2. One school of "Whitebellies" was reported by the fish spotter in the crow's nest at 07:32.

3. One school of "Whitebellies" was reported by the fishing master at 07:53.

4. One school of "Whitebellies" was reported by the fishing master at 08:16.

5. Two unidentified Ziphids were located from the bridge of the NICOLE K at 09:00. They were tentatively identified as *Ziphius cavirostris* or *Mesoplodon sp.* At 09:20 the helicopter landed.

While the tuna purse-seine vessel was stopped to facilitate helicopter recovery, a speedboat was deployed with Pitman and Armstrong aboard to capture and tag sea turtles while the NICOLE K remained in search mode. The Beaufort sea state was 0. We captured, tagged, measured, and released six olive ridley sea turtles between 09:25 and 10:55. The speedboat returned to the vessel when Capt. Madruga was ready to conduct search effort in the helicopter.

Turtle operations summary

1. Three male, one female, and two undetermined sex olive

²⁴Specimens collected were donated to the Scripps Institute of Oceanography fish collection.

ridley sea turtles were captured and processed aboard the speedboat. The data was recorded on sea turtle life history records #62-#67 (Table 9 and APPENDIX IV).

Helicopter flight #2:

The helicopter was deployed at 11:00 to check a school of dolphins located by a member of the scientific field party aboard the McARTHUR. The Capt. Madruga located the school and reported a school of "whitebellies."

1. A school of common dolphins located by scientist on the McARTHUR was checked by the helicopter.

2. A large scattered group of bottlenose dolphins was sighted from the pilot house of the NICOLE K. One olive ridley sea turtle was observed basking at the surface near the bottlenose dolphins. At 12:25 the helicopter landed.

Sightings from NICOLE K:

1. Scientist Pitman observed a small, possibly green sea turtle, *Chelonia mydas*, at 13:00.

2. One olive ridley sea turtle was observed at 9°27'N and 98°11'W at 13:35.

3. One olive ridley sea turtle was observed at 9°28'N and 98°10'W at 13:39.

4. A scattered school of bottlenose dolphins was sighted from the pilot house at 14:13.

Helicopter flight #3:

The Helicopter departed at 14:20.

1. A school of an estimated 50 "whitebellies" was reported by the fishing master at 14:40.

2. A school of an estimated 30-40 "whitebellies" was reported by the fishing master at 15:40. The helicopter returned to the ship at 16:00.

Sightings from NICOLE K:

1. A school of an estimated 100-150 striped dolphins was observed from the pilot house at 16:45. The searching effort ended at 17:00. The NICOLE K jogged to the 97°W longitude line and drifted for the remainder of the night.

22 November 1992

Search effort started at 06:00 and the vessel's position was 10°38'N and 96°38'W.

Helicopter flight #1:

The helicopter departed at 07:20. The McARTHUR'S observers reported a flock of seabirds on the horizon. The helicopter headed toward the birds to check for the presence of dolphin and tuna. The observers lost track of the bird flock. The helicopter circled the area where the birds were last seen, but the seabird flock was not located so the helicopter resumed its normal search pattern.

1. At 08:03 the fish spotter in the crow's nest located a

school of dolphins and sent the helicopter to investigate. Capt. Madruga circled the school in the helicopter and reported an estimated 150 spotted dolphins. There were no tuna associated with the spotted dolphins.

2. At 08:37 a flock of birds was detected on bird radar and the helicopter was provided with a bearing and a distance to the school. Capt. Madruga reported an estimated 100 spotted dolphins, loosely aggregated and spread out over a couple of miles. The dolphins were not carrying tuna.

3. A school of spotted dolphins was reported by the fishing master at 09:07. The helicopter was 13.5 miles from the NICOLE K. Capt. Madruga located an estimated 600 spotted dolphin carrying "fair" fish. He reported the dolphins at the front of the school were carrying 30 tons of yellowfin tuna. The MCARTHUR was contacted to provide the bearing to the helicopter. The information reported by Capt. Madruga was relayed to Michael Scott. The helicopter landed to refuel at 09:40. Five speedboats were deployed and the dolphins were chased after the helicopter been launched.

Set No. 7

The purse-seine was deployed at 10:42 and the set position was 11°08'N and 96°21'W. The Beaufort sea state was 0. The fish tagging team entered the net in the AR-1 shortly after towline came in and started handline fishing for yellowfin tuna. After "rings up" Capt. Madruga told me he needed to roll the net slowly to counteract the effect of a subsurface current and reduce the possibility of a net collapse. The AR-3 was deployed and the launch personnel were instructed where to attach the tagging team's rafts to the corkline. Shortly after the tagging team had deployed their rafts, Rick Lindsay entered net with an eight-foot inflatable raft and picked up Michael Scott at the AR-1.

The tuna tagging team fished with handline gear with no swimmers in the net until the 1/2-net marker was rolled aboard. After the 1/2-net marker was rolled aboard, Armstrong, Pitman, and two crew members entered the net with snorkeling gear and moved toward the dolphin school in order to allow the dolphins to grow accustomed to their presence inside the net. Michael Scott gave the order to capture a dolphin and a fused female northern offshore spotted dolphin (D2) was delivered to the tagging team. The tagging team attached a standard radio-transmitter tag (tuned to 148.138 MHz) to the dorsal fin of D2 and released it inside the net. After D2 was released inside the net, Michael Scott contacted Capt. Madruga with his hand held VHF radio to initiate the backdown procedure. No tuna were captured or tagged by the tuna tagging team during the set. The dolphins happened to be released first during the backdown procedure, and shortly afterwards an estimated 10 tons of yellowfin tuna swam out over the deeply submerged corkline at the apex of the PSP. Backdown was completed at 13:00 and all captured dolphins and tuna were released from the net. The dolphin tracking

team was in position outside the PSP corkline and started tracking the dolphins as soon as they were released from the net. The skiff was pulled aboard and the set was completed at 13:33. The NICOLE K's scientific field party prepared to assist with dolphin tracking operations after the set was completed.

Helicopter flight #2:

At 13:35 the helicopter was launched to assess the dolphins associated with D2 to determine if they were carrying tuna. Capt. Madruga reported observing two groups of dolphins and neither group was carrying tuna. One group of dolphins was swimming around the AR-4 and there was another group of dolphins observed a few miles ahead of the tracking launch so the helicopter flew over it. Capt. Madruga contacted the scientific personnel aboard the tracking launch to report he had seen D2 among the dolphins which were a few miles ahead of the AR-4. The helicopter landed and searching effort ended at 14:55. The NICOLE K followed the tracking launches during the remainder of the afternoon to be in position to assist with tracking operations if necessary.

Michael Scott contacted the NICOLE K at 21:00 and requested assistance with tracking operations. The NICOLE K approached the tracking launch until D2's radio-transmitter signal was picked up by the receiver and ATS in the crow's nest. D2 was tracked from 21:00-22:30. Our assistance with tracking effort provided time for the tracking launch to undergo routine maintenance, refueling, and to make a crew change. The AR-4 resumed tracking of D2 at 22:30.

23 November 1992

Started search effort at 06:00 and the vessel's position was 10°43'N and 96°25'W.

Helicopter flight #1:

The helicopter departed at 07:15. The helicopter headed directly to the school of dolphins being tracked by the McARTHUR. Capt. Madruga reported seeing a group of dolphins 2.5 miles ahead of the McARTHUR. These cetaceans turned out to be a group of eight rough-toothed dolphins, *Steno bredanensis*, feeding around a log. At 07:50 the fishing master reported he was over a school of spotted dolphins and he had located D2 in the school. The McARTHUR was called and informed that they were 2.0 miles from the radio-tagged dolphin to permit the tracking personnel to calibrate D2's radio transmitter signal intensity with distance. The McARTHUR's bridge personnel were asked to reduce the speed of the ship to limit noise and attempt to prevent the dolphin school from dispersing. The helicopter flew over D2's school and Capt. Madruga reported an estimated 300 spotted dolphins carrying 10-15 tons of tuna. This information was relayed to Michael Scott and both vessels made preparations for set and tagging operations.

Set No. 8

The purse-seine was deployed at 08:55 and the set position was 10°28'N and 96°20'W. The set was made on the school of spotted dolphins associated with D2. The entire school was captured along with an estimated 15-20 tons of yellowfin tuna. When the school was encircled, Michael Scott was called and informed that the entire school of dolphins had been captured and conditions were safe for the fish tagging team to enter the net when they were ready to start handline fishing.

Handline fishing for tuna inside the net began at 09:25 and the McARTHUR deployed the AR-3 and AR-4. The AR-3 traveled to the corkline on the stern side of the PSP and deployed the dolphin tagging team personnel and their rafts. The AR-4 was positioned outside the net in preparation for tuna tracking operations. At "rings-up" Rick Lindsay entered the net with an eight-foot inflatable raft and picked up Michael Scott at the AR-1. A bottlenose dolphin had inadvertently been captured with the spotted dolphins during the set. It was first sighted after encirclement slow rolling among rafting spotted dolphins. The net was rolled slowly while tuna handline fishing operations were conducted inside the net. Prior to when the half-net marker was rolled aboard, a 20 pound yellowfin tuna was gilled in the webbing near the ship and it was still alive. A crewman entered the net to retrieve the fish and he delivered the fish to the tuna tagging team in the AR-1. The fish was tagged by hand with a depth-sensitive transmitter (60 kHz) and released inside the net. It swam away weakly and was not expected to survive.

Handline fishing for tuna continued with no swimmers in the net until after the half-net marker was rolled aboard. After the half-net marker was rolled aboard the ship, Armstrong, Pitman, Au, and two crewmen entered the water with snorkeling gear. Capt. Madruga slowly rolled the net to allow tuna handline fishing and dolphin capture and tagging operations to proceed simultaneously. Michael Scott instructed swimmers to capture two dolphins. The first dolphin captured was a fused male northern offshore spotted dolphin (D3), the second dolphin captured was a heavily spotted fused female northern offshore spotted dolphin (D4). The tagging personnel attached a TDR/radio-transmitter (tuned to 148.090 MHz) package to the dorsal fin of D3. A standard radio-transmitter (tuned to 148.111 MHz) package was attached to the dorsal fin of D4. No effort was made to recapture D2. When D4 was being tagged some other dolphins in the net started to struggle in a small net collapse at the apex of the PSP. The swimmers moved to the apex of the PSP and started hand releasing dolphins.

One fishing crew member, Bob Olson, and Kim Holland attempted to attach VEMCO ultrasonic-transmitter tags to tuna with a lance. Two tunas were lance-tagged by the crewman. One tuna was tagged with a depth-sensitive transmitter (60 kHz) which was the same frequency

as the gilled tuna tagged earlier in the set, and the other was tagged with a pinger (69 kHz). Prior to backdown there were three tagged tunas in the net (one gilled tuna and two-lance tagged fish). Swimmers hand released dolphins over the corkline near the apex of the backdown channel during backdown and all of the dolphins were released alive from the net. Two of the sonic-tagged tuna were observed going out of net after most of the dolphins had been released. The two fish which were observed leaving the net had been tagged with transmitters tuned to the same frequency. Both were tagged with depth-sensitive transmitters (60kHz). This occurred because the tagging team thought the gilled tuna was in such poor condition that it would not survive so they used another depth-sensitive transmitter with the same frequency as the gilled tuna on a lance-tagged tuna. This created confusion in the tracking launches when the two fish tagged with the same frequency sonic-transmitters swam in opposite directions. The signal was lost before the heading of either of the fish could be determined. Approximately four tons of fish remained in the net after backdown. They would not go out over the sunken corkline at the end of the backdown channel so these tuna were brailed aboard the boat. Each fish was inspected for tags or signs of tagging before the tuna were loaded inside the fish well. No tags were recovered but a fish was observed that had a fresh puncture wound in the dorsal musculature which looked like it may have been made by a sonic-transmitter tag. The scientific field party processed 18 yellowfin tuna after the skiff came aboard at the end of the set (Table 5).

Helicopter flight #2:

At 12:45 the helicopter went aloft to check the dolphin school released at the end of Set 8. Capt. Madruga reported the original school had split into two groups. The AR-3 was tracking the group that contained D2 and D3, and the AR-4 was tracking the group that had D4 in it. The spotted dolphin school associated with D2 and D3 was estimated by Capt. Madruga to be composed of 300 dolphins. He reported the group of spotted dolphins being tracked from the AR-3 were widely scattered and he saw no birds or tuna associated with the school. The group of spotted dolphins associated with D4 was being tracked from the AR-4. This group of dolphins was reported to be tightly aggregated, and Capt. Madruga made an estimate of 150 spotted dolphins in the school. There was a flock of approximately 50 seabirds working over the tuna/dolphin aggregation being tracked by the AR-4. The fishing master described seeing yellowfin tuna jumping near the dolphins and estimated this school was carrying 15 tons of tuna.

The two schools of spotted dolphins being followed by the tracking launches had separated at backdown and eventually ended up being 13 miles apart. Cmdr. Peterson indicated he wanted the AR-4 to join the AR-3 at the other school of spotted dolphins (with D2 and D3), in order for the McARTHUR to maintain reasonable proximity to both launches. The NICOLE K was instructed to start tracking D4. The vessel moved into position and at 14:00 the radio-tracking receiver

started picking up a strong signal from D4's radio-transmitter. When the ATS indicated the direction of D4, the NICOLE K assumed tracking effort. The AR-4 headed back toward the AR-3 and the McARTHUR.

Rick Lindsay familiarized the scientific field party members with the operation, adjustment, and interpretation of the electronic tracking gear in the crow's nest so each of us were competent to stand a tracking watch. A schedule of two-hour shifts was set up for each member of the scientific field party so we would be prepared to track D4 throughout the night. The dolphin school was positioned at least two to three miles ahead of the NICOLE K to minimize the effect of ship noise on the dolphins behavior. While the ship was in tracking mode, it drifted until the radio-transmitter signal started to weaken. When the signal started to weaken the ship was directed to creep up slowly on the dolphin school and resume drifting as soon as the signal was strong again. The dolphins remained tightly grouped and milled at the surface several miles ahead of NICOLE K during the majority of the daylight tracking effort. The radio signals transmitted by D4's radio tag were rarely more than 45-60 seconds apart. The most commonly observed surfacing pattern was two or three respirations 10-15 seconds apart followed by a 45-60 second submergence. Late in the day, the McARTHUR abandoned D2 and D3 and picked up the tracking launches and ran 30 miles to the NICOLE K's position. At 21:50 the McARTHUR's tracking launches resumed tracking of D4. From 14:00 until we turned the tracking over to McARTHUR's tracking launches at 21:50, the dolphins had only traveled 6-7 miles. The NICOLE K fell back and drifted most of the night.

24 November 1992

The vessel's position was 10°00'N and 96°37'W at 06:15. One small olive ridley sea turtle was observed at 06:45 and its position was recorded (9°58'N and 96°44'W).

Helicopter flight #1:

At 07:15 the helicopter departed and travelled to the school of dolphins being tracked by the McARTHUR to determine if the dolphins were still carrying tuna. Capt. Madruga reported he observed "black porpoise" (fisherman's slang for a number of cetacean species, in this case he referred to rough-toothed and bottlenose dolphins) mixed among the spotted dolphins being tracked by the McARTHUR. The dolphin school was running and spreading apart. The NICOLE K located a log at 07:57 and maneuvered to assess it for tuna. The log had attracted a large school of bait near the surface, but the ship's echo sounder did not detect associated tuna. The vessel resumed its course toward the helicopter.

The speedboats were deployed at 08:12 and were positioned behind the purse-seiner as we approached the school. When the ship was within 1.5 miles of the dolphin school Capt. Madruga directed the speedboats to chase the dolphin. After a few minutes of chase, the

school scattered in all directions so Capt. Madruga called off the chase. The speedboats were picked up and the helicopter landed to refuel. Capt. Madruga decided it would be a good strategy to allow these dolphins settle down and regroup for at least an hour before he attempted to chase them again.

The NICOLE K passed through a concentration of sea turtles and at least 10 unidentified sea turtles (probably Olive ridley) were observed during the hour we waited to resume the chase. No turtle capture/tagging operations were conducted because they would have interfered with set operations. The helicopter departed and flew toward the school at 09:55. At 10:08 the speedboats were lowered and the chase was resumed.

Set No. 9

The purse-seine was deployed at 10:30 and the set position was 9°58'N and 97°04'W. D4 was recaptured along with an estimated 15 tons of yellowfin tuna. The McARTHUR's bridge watch officer was called when the school was encircled and informed that it was safe for the tuna tagging team to enter the net to conduct handline fishing operations. The AR-1 entered the net at 10:50. Capt. Madruga directed the tuna tagging team to the area inside the net where the fish were located near the surface. They started handline fishing at 10:55.

Shortly before "rings-up," Rick Lindsay entered the net with the eight-foot inflatable raft and picked up Michael Scott. Michael Scott was contacted by radio to determine what his priorities were for the set. He stated that he intended to capture one dolphin and attach a TDR/radio-transmitter package to its dorsal fin. After the dolphin was tagged, he planned to conduct a concentrated effort to tag several tuna. Approximately 35 minutes after handline fishing operations had started, scientist Pitman entered the water with snorkeling gear. The AR-3 and AR-4 were deployed and they moved into tagging/tracking position. At 11:35 the dolphin tagging team was deployed in their rafts and they moved to their designated position in the PSP. Two crewmen were directed to enter the water after the half-net marker was rolled aboard the ship. They were instructed to swim to the AR-1, pick up tuna tagging gear, and receive instructions from scientist Olson.

Scientist Armstrong entered the net with snorkeling gear and a video camera when the half-net marker was rolled aboard to record video footage of the tagged dolphin in the net and to assist with dolphin capture. Swimmers captured a fused female northern offshore spotted dolphin (D5) and conveyed it to the tagging team. A TDR/radio-transmitter (tuned to 148.300 MHz) package was attached to D5's dorsal fin. After D5 was processed by the tagging team, it was released into the net. Michael Scott contacted the fishing master by radio and requested a slow backdown to concentrate tuna near the surface and facilitate attachment of sonic-transmitters

with a lance. A crewman attached ultrasonic-transmitters to two tunas using the lance-tagging method. One fish was tagged with a depth-sensitive transmitter (60 kHz) and the other was tagged with a pinger (65.54 kHz). Michael Scott ordered a hard backdown. The dolphins were all released from the net during backdown. Three quarters of the tuna school were released during backdown, but unfortunately the tagged fish remained in the net after backdown was completed. Pitman and Armstrong attempted to capture the tagged tunas with the experimental tuna dip net, constructed at the beginning of the charter, following backdown and during the subsequent net roll process. Unfortunately the floor of the net had sunk very deep and the fish were no longer travelling near the surface. Attempts to capture tuna with the experimental dipnets were unsuccessful. Three tons of yellowfin tuna were brailled into a fishwell and each yellowfin tuna that came aboard was examined for physical evidence of tagging. Two fish came aboard with puncture wounds in their dorsal musculature where tags may have been attached and shed, but no tags were recovered. The set ended at 13:30 and the NICOLE K was free to look for logs, and schoolfish for the remainder of the day. A sample of 19 yellowfin tuna were processed by the members of the scientific field party (Table 6) when the set was completed. The fishing master was instructed to remain within 15 miles of the tracking launches in case we were needed to assist with dolphin tracking operations.

Helicopter flight #2:

The helicopter departed at 15:15 and searched a 10 mile box pattern around the McARTHUR. At 15:25 Capt. Madruga reported a school of "whitebellies" with one Booby bird associated with the dolphins. The helicopter landed at 16:15 and a speedboat was deployed with a driver, Armstrong, and Pitman aboard to search for sea turtles. The Beaufort sea state was 0. No turtles were located and turtle operations were concluded at 17:00.

Summary of operations:

1. One female fused northern offshore spotted dolphin (D5) was tagged and released.
2. The radio-tagged fused female northern offshore spotted dolphin (D4) was encircled during the set, but no effort was made to capture the dolphin or to remove the tag.
3. Two yellowfin tuna had sonic-transmitters attached with a lance, but neither fish was released from the net during backdown or during ensuing capture efforts after backdown. The tagged tunas may have been recovered, but the tags were not.
4. A sample of 19 yellowfin tuna was processed by scientific field party (Table 6).

25 November 1992

The NICOLE K drifted most of the night and traveled only when it was necessary to remain within one hour of the tracking vessels. The morning position was 9°49'N and 96°42'W.

Helicopter flight #1:

The helicopter departed at 07:25 to assess the amount of tuna the dolphin school associated with D5 was carrying. The Beaufort sea state was 3 with a confused swell. Cmdr. Peterson was contacted to establish if he could deploy tracking launches in these conditions. His response was the sea conditions were on the "outer edge" of his vessel's ability to launch and recover the 27-foot tracking launches. The NICOLE K positioned itself parallel to the McARTHUR to pick up the radio signal from D5, and to help Capt. Madruga locate the school.

The McARTHUR's tracking team was receiving the radio-transmitter signal from D5. During the night (04:00) they had lost the radio-transmitter signal from D4. After D4's signal was lost, the tracking team concentrated their efforts on following D5 for the remainder of the night. The fish spotter in the crow's nest located a spotted dolphin school at 07:50 and directed the NICOLE K to their location. The vessel was 4.5 miles from the school and the fishing master flew over the dolphins and estimated 1000-1500 spotted dolphins in the school. Rick Lindsay was operating the tracking gear and he scanned previously deployed dolphin radio-transmitter frequencies with the tracking receiver to determine if D3 or D4 were in the school. D3's radio-transmitter signal was detected in the school. It had been associated with the school of dolphins left behind when the McARTHUR picked up its tracking launches and came to track D4 on the evening of 23 November 1992. Capt. Madruga assessed the dolphin school for tuna at 08:40. He reported seeing only 2-3 tons of tuna after he pushed the school downwind with the helicopter. This information was relayed to the Michael Scott and he instructed the NICOLE K to break off the school and look for something else. We left the school of dolphins at 08:52 and their position was 9°35'N and 96°35'W. The helicopter landed at 09:05.

Helicopter flight #2:

The helicopter was deployed at 10:30 to inspect a seabird flock located from the crow's nest. At 10:50 Capt. Madruga located a school of an estimated 500 "whitebellies." No seabirds or tuna were seen with the dolphins. At 12:10 Capt. Madruga checked a school of spotted dolphins located by the fish spotter in the crow's nest. Capt. Madruga reported an estimated 1000 spotted dolphins in the school. His observations indicated the dolphins were only carrying 2-3 tons of tuna. This information was passed to Michael Scott. The helicopter returned to the ship at 12:30.

Helicopter flight #3:

The helicopter departed at 14:25 and flew toward the school of dolphins being followed by the McARTHUR's tracking launch. The McARTHUR had approached within a 1/2 mile of the school to listen for tagged tuna with a tracking hydrophone but this caused the dolphin herd to split into two groups. Capt. Madruga suggested the tracking vessel should fall back 3 or 4 miles to allow the dolphin

school to regroup. He examined the group of dolphins associated with the D5 first and reported an estimated 700-800 spotted dolphins. After several circles around the school he located D5. The McARTHUR was 2 miles from the school of dolphins. Capt. Madruga inspected the other piece of the school and reported an estimated 500-600 spotted dolphins. The radio tracking receiver was tuned to 148.111 MHz to determine if D4 was present in the school, but after 15 minutes of monitoring no signal was detected. Capt. Madruga reported this group of dolphins was carrying an estimated 15 tons of tuna. It was past cut-off time and thus too late to set and perform tagging operations. The helicopter landed at 15:35 and the radio-tracking receiver was monitored for D4's radio-transmitter signal while the NICOLE K drifted for the remainder of the day.

26 November 1992

Started search effort at 06:40 and the vessel's position was 9°12'N and 96°48'W.

Helicopter flight #1:

The helicopter departed at 07:15 and flew toward the school being followed by the McARTHUR's tracking launch. Capt. Madruga located D5 in the school at 07:45. The NICOLE K's ATS indicated a strong signal from D5's radio-transmitter on the bow. The speedboats were deployed from the NICOLE K at 08:30 and the drivers were instructed to follow the purse-seiner until the vessel approached within 1.5 miles of the school.

Set No.10

The purse-seine was deployed at 08:53 and the position of set was 9°06'N and 96°59'W. After the school was encircled, Capt. Madruga located D5 inside the net. He estimated approximately one ton of fish were captured during the set. The AR-1 entered the net at 09:40 and the tuna tagging team initiated handline fishing effort. The captured tuna remained deep in the net. The AR-3 was deployed and it delivered the dolphin tagging personnel to the attachment position on the PSP corkline. At "rings-up," Rick Lindsay entered the net and paddled the eight-foot inflatable raft to the AR-1 to pick up Michael Scott. They made observations of dolphin behavior in the net as they travelled along the corkline moving steadily toward the dolphin tagging personnel located near the apex of the PSP. Michael Scott called the NICOLE K during the early stages of net roll procedure to outline his planned operations for the set. He instructed swimmers to capture D5 and deliver it to the tagging station for tag removal. After D5 had been released, the swimmers were instructed to capture one additional dolphin and deliver it to the tagging station.

When the half-net marker was rolled aboard, Armstrong and Pitman entered the net with snorkeling gear. Shortly afterwards, several

crewmembers entered the net to assist with dolphin capture and hand rescue effort during the backdown procedure. D5 was captured and delivered to the tagging station and the tagging personnel removed the TDR/radio-transmitter package from the dorsal fin, photographed the dolphin, and released it inside the net. A fused female northern offshore spotted dolphin (D6) was captured and delivered to the tagging team. They attached a standard radio-transmitter (tuned to 148.190 MHz) package to it's dorsal fin and released it inside the net. D6 showed no external signs of injury but during the tagging procedure it was breathing irregularly and its body was flexed laterally. D6 appeared stunned when it was released and it rested near the surface and panned its head from side to side for several seconds before it slowly swam away and rejoined the rest of the dolphins inside the net. During the backdown procedure several attempts were made to attach ultrasonic-transmitters to tunas using a lance. There were only 23 tuna in the net and they remained too deep in the backdown channel for skin divers to reach them. No tuna were tagged during the set. All of the dolphins were released from the net but the tuna would not exit over the submerged corkline during backdown. A sample of 21 yellowfin tuna was processed after the set was completed (Table 7).

Summary:

1. The fused female northern offshore spotted dolphin (D5) tagged with a TDR/radio-transmitter (148.300 MHz) package was recaptured. The instrument package was removed, and the dolphin was photographed and released inside the net.

2. A fused female northern offshore spotted dolphin (D6) was captured and tagged with a standard radio-transmitter (148.190 MHz) package.

3. There were 23 yellowfin tuna rolled aboard the work deck in the bow ortza pocket. A sample of 21 yellowfin tuna was processed by the scientific field party (Table 7).

The set was completed at 11:30 and Michael Scott instructed the NICOLE K to head back toward the last known position (9°22'N and 96°48'W) D3's signal had been detected on 25 November 1992 at 23:00. McARTHUR's tracking team abandoned tracking of D6 shortly after 12:00 and picked up the tracking launches and started following the NICOLE K.

Helicopter flight #2:

The helicopter was deployed at 13:22 and started search effort. Capt. Madruga located a school of spotted dolphin at 13:40 approximately 13 miles ahead of the NICOLE K. The radio-transmitter receiver was being monitored and it detected a weak signal from D3's transmitter. The ATS was not indicating a direction so the NICOLE K headed toward the dolphin school being examined by the helicopter. As the vessel approached the dolphin school, the signal from D3's radio-transmitter got stronger and the ATS indicated the tagged dolphin was among the dolphins being circled by the helicopter.

Set No. 11

The purse-seine was deployed at 15:26 and the set position was 9°36'N and 96°49'W. Rick Lindsay helped direct the helicopter toward D3 during the chase using the ATS in the crow's nest. Capt. Madruga made the set on an estimated 15 spotted dolphins. Seven spotted dolphins were captured; however, D3 evaded the set shortly after the net was deployed by diving under the bow of the NICOLE K. All of the dolphins were released alive during the backdown procedure. Approximately 1.5 tons of yellowfin tuna, one smoothtail mobula, and a blue shark were rolled aboard in the bow ortza pocket. Following the set, Cmdr. Peterson reported his NOAA Weather FAX predicted gale force winds in the Gulf of Tehuantepec for the following morning. He wanted to leave the area because his vessel would not be able to launch and recover the tracking launches if a swell started to build as a result of gale force winds blowing in the Gulf of Tehuantepec. Both vessels ran west all night to escape the storm.

Capt. Madruga spoke to some tuna purse-seine vessel skippers fishing "dolphin-safe" in the area of 10°N latitude and 103-108°W longitude who had reported seeing schools of spotted dolphins that were carrying tuna. This information was relayed to Michael Scott and he scheduled an evening meeting. Kim Holland requested us to bring a large tuna to the meeting so the tagging team could practice attaching tags to the fish and determine how the tags were holding on to the fish after they were applied with a lance. We also transported frozen dolphin specimens, fish specimens collected dipnetting and during sets, and large items that would not be needed after the McARTHUR had to depart for San Diego.

The meeting was convened in the McArthur's wardroom. We discussed research priorities for the remaining days of the charter. The McARTHUR's tentative departure date to get the ship to San Diego on schedule was calculated to be 14:00 on 29 November 1992. Michael Scott hoped to locate a school of spotted dolphins carrying at least 15 tons of tuna, and he intended to make a set to tag and track tunas. If we did not locate a school that had at least 15 tons of fish by 27 November on 28 November he would be satisfied to set on any school, with any amount of fish, and tag and track the tuna. During the set if Capt. Madruga could not release all the tuna simultaneously with the dolphins during backdown, Michael Scott wanted him to roll the net after backdown to the sack up position, and drop the bow ortza to release the tuna remaining in the net. The proposed post-backdown ortza release procedure was discussed with Capt. Madruga and he was willing to try it.

27 November 1992

The vessels position was 9°32'N and 99°09'W at 07:05 and both vessels were running west in an attempt to locate calmer sea conditions that would permit the deployment of the tracking

launches. The fish spotter in the crow's nest located a school of dolphins at 11:30 that had a flock of seabirds and jumping tuna associated with the school. The size and species composition of the school was estimated to be 500-750 spotted dolphins and approximately 15-20 bottlenose dolphins. Michael Scott assessed the situation and decided to wait for a school that had more fish. The vessels continued search effort and ran to the west.

Chuck Oliver called from SWFSC to clarify what the NICOLE K's scientific field party should try to accomplish, after the McARTHUR departed, during the remaining five to six days of the 30-day charter. He indicated that we should endeavor to locate logfish or schoolfish and make sets to collect stomach samples of high-trophic level predators associated with schools of yellowfin tuna. The fish spotter in the crow's nest located a large school of spotted dolphins at 15:35. There was a flock of seabirds working over the school and tuna boiling²⁵ at the surface. The sea conditions were unsuitable to launch the tracking launches so both vessels continued to run west. The dolphin search effort ended at 16:00 and the ships ran west all night.

Sighting summary:

The helicopter was not deployed because sea conditions were unsuitable for deploying tracking launches.

1. The fish spotter in the crow's nest located a school of spotted dolphins. There was a flock of birds and yellowfin tuna associated with the dolphins. The school was composed of an estimated 500-750 spotted dolphins and approximately 15-20 bottlenose dolphins.

2. The fish spotter in the crow's nest located a large school of spotted dolphins with a flock of seabirds and a boiler of yellowfin tuna associated with the school. Sea conditions were too rough to deploy the tracking launches.

28 November 1992

The ships position was 9°49'N and 103°54'W at 07:00. Michael Scott directed the vessels to head northwest to try to find suitable sea conditions for deploying and recovering the tracking launches. A large swell had developed from the northeast and the Beaufort sea state was between 4 and 5. It was obvious at midday that the sea conditions would continue to be unsuitable for deploying tracking launches during the remainder of the day so searching effort ceased and the ships ran northwest. The course the vessels were following would position the NICOLE K several days from the closest known log and school fishing areas when the McARTHUR departed for San Diego. Both vessels ran all night.

²⁵Tuna feeding aggressively at the surface creating a foam that resembles boiling water.

29 November 1992

The ships position was 14°04'N and 105°59'W at 06:55 and it was raining. When the vessel cleared the rain, search effort was initiated. Michael Scott informed me that our northwest course had extended the McARTHUR's time in the study area by approximately 40 hours compared to the previous calculation.

Helicopter flight #1:

The helicopter was deployed at 08:30 and search effort began. Capt. Madruga located a scattered school of spotted dolphins at 09:25 which he reported was carrying a few fish (2-3 tons). He estimated the school size to be 150 spotted dolphins. This information was passed to Michael Scott to determine if he wanted to try and make a set and he told us to look for a school that was carrying more fish. The ships resumed searching effort and at 10:45 the helicopter landed.

Helicopter flight #2:

The helicopter departed at 12:00. The helicopter was summoned by the McARTHUR's observers shortly after take-off to check some birds and dolphins sighted from the ship. Capt. Madruga assessed the school and reported it was composed of an estimated 20 spotted dolphins and they were not carrying tuna. The helicopter checked a flock of seabirds on the ship's bow at 12:45. The seabird flock was associated with a mixed school of spotted dolphins and eastern spinner dolphins, *Stenella longirostris*. Capt. Madruga estimated the dolphin school size to be 50-75 individuals. There were no tuna associated with the dolphins. Capt. Madruga located a small school of spotted dolphins at 13:15 and there were no tuna associated with the school. The helicopter landed at 13:30.

30 November 1992

The weather conditions deteriorated during the night. Sustained wind speeds of up to 30 knots were reported by crew members on watch, and the size of the swell had steadily increased throughout the night. It was still dark and raining hard at 07:00 and the vessel's position was 15°39'N and 106°58'W. The Beaufort sea state was 5. Michael Scott was contacted at 07:45 to discuss planned research operations for the day. He assessed the situation and stated since the McARTHUR couldn't work in the currently available sea conditions he was instructing the Cmdr. Peterson to take the ship north to San Diego. Michael Scott instructed us to leave the tracking gear installed on the NICOLE K's mast in case the ship travelled through the area where D3 was last detected on its trip to log and school fish areas. If we located D3, he wanted us to attempt to recapture it and remove the TDR instrument package from its dorsal fin. All other tracking gear, bedding, and other large gear unnecessary to perform duties during the block of time remaining in the 30-day charter, and any time spent aboard the NICOLE K subsequent to the charter was packed and transferred to

the McARTHUR by speedboat. David Au was transferred to the McARTHUR by speedboat also. The transfer of equipment and personnel was completed at 09:35. When the vessels separated the NICOLE K ran southeast.

The ships position was 14°41'N and 106°04'W at 17:30 and the compass heading was 140°. The weather map indicated a tropical depression centered at 12°N and 101°W. The depression was directly in our path to the log and school fishing areas. At 19:00 Capt. Madruga ordered everyone to be sure that anything left outside was tied down because he expected the weather to get rough. All NMFS gear was stored and lashed down inside the speedboat room. The vessel ran all night.

1 December 1992

The vessels position at 07:00 was 12°28'N and 105°32'W. The Beaufort sea state was 5, and 6-foot swells originated from the southeast. The ships heading was 140°. It was bucking the swell, a strong current, and making 9-10 knots. Although the Beaufort sea state was 4 and the swell continued to be large, search effort started at 12:30. The search effort ended at 17:00.

2 December 1992

Search effort was started at 07:00 and the vessel's position was 9°51'N and 101°58'W. The Beaufort sea state was 4 and the ship's heading was 110°.

Helicopter flight #1:

The helicopter departed at 08:15. Capt. Madruga inspected a log with a small ball of bait and no tuna at 08:40. The fishing master located a large scattered mixed school of spotted dolphins and spinner dolphins with a very small amount of fish (< 1 ton) at 09:55. The helicopter landed at 10:15. The NICOLE K circled a log at 10:45 and its position was 9°31'N and 101°25'W. There was a breazer of bullets, *Auxis* sp., associated with the log but no tuna were detected.

Helicopter flight #2:

The helicopter departed at 12:45. A crewman on the 20X glasses in front of the pilot house located an estimated 10-12 spotted dolphins at 14:05. There were three unidentified Frigatebirds *Fregata* sp., a few Red-footed boobies, *Sula sula*, and Wedge-tailed shearwaters, *Puffinus pacificus*, but no tuna associated with the dolphins. The helicopter landed at 14:40. Search effort ended at 17:15 and the position was 9°26'N and 100°16'W. The vessel ran throughout the night.

3 December 1992

Search effort started at 06:35 and the vessel's position was 9°43'N and 97°34'W.

Helicopter flight #1:

The helicopter departed at 07:35. The fish spotter in the crow's nest located a small school of spotted dolphins at 07:50. Capt. Madruga located a large scattered mixed school of spotted and spinner dolphins at 08:09. The fishing master located an estimated 400 spotters carrying 3-4 tons of tuna at 08:30, and at 08:40 he reported flying over a school of "whitebellies."

The NICOLE K was contacted by a U.S. Navy warship at 08:45 to request the right of way. They asked for standard information to check the ships documentation and steamed to Acapulco for a medical evacuation of someone aboard their ship. The helicopter landed at 09:40. At 11:30 a small school (4 or 5) of short-finned pilot whales was sighted from the pilot house.

Helicopter flight #2:

The helicopter departed at 14:15. A school of "whitebellies" was reported by Capt. Madruga. Later in the flight he reported a small school of spotters, but they were not carrying tuna. Near the end of the flight Capt. Madruga located a large mixed school of spinners and spotters (80% spinners, 20% spotters) but they were not carrying fish. The helicopter landed at 15:55.

The vessel stopped searching at 17:00 and it's position was 9°52'N and 95°35'W. The ship ran all night.

4 December 1992

The vessels position was 9°14'N and 93°34'W at 06:10 and search effort started at 06:25. I attempted to send the weekly summary of research activities conducted aboard the NICOLE K to SWFSC by FAX at 07:00 but it did not transmit. I reattempted to send the weekly summary at 08:25 and the FAX machine indicated that it was transmitted.

Helicopter flight #1:

The helicopter departed at 08:25. An estimated 20-25 bottlenose dolphins were observed from the vessel at 09:05. A school of "whitebellies" was reported by Capt. Madruga at 09:25. There was a flock of seabirds associated with the dolphins but no yellowfin tuna were present. A school of "whitebellies" was reported by the fishing master at 09:40. The helicopter landed at 10:35.

Helicopter flight #2:

The helicopter departed at 12:40. Capt. Madruga located a log at 12:55 and there was a breazer of bullets associated with the log. The fishing master located another log at 14:20. He reported seeing bait associated with the log, but there were no tuna present. Three schools of "whitebellies" were located by Capt. Madruga. The helicopter landed at 14:45. Search effort ended at 16:55 and the vessel ran all night.

5 December 1992

The vessel's position was 7°36'N and 89°55'W at 05:45 and search effort started at 06:00. A small school of dolphins was located by a crewman in the crow's nest at 07:10, but there were no fish associated with the dolphins. One olive ridley sea turtle was sighted from the pilot house at 09:37. A school of an estimated 200-300 common dolphins was sighted from the pilot house at 09:38. Two Red-footed boobies, and a couple Leach's storm-petrels, *Oceanodroma leucorhoa*, were observed associated with the school. The Beaufort sea state was 0 at 09:45 and sea turtles were being sighted frequently from the ship. A speedboat and driver were deployed and Pitman and Armstrong were aboard to conduct sea turtle capture and tagging operations while the boat continued searching for logs and schoolfish.

Summary of turtle operations 0945-1150:

1. A total of seven olive ridley sea turtles were captured during this operation. The data was recorded on sea turtle life history forms #68-#74 (Table 9 and APPENDIX IV).

a. One previously tagged female olive ridley sea turtle was captured and the tag was removed and saved (Table 9). Several unidentified stalked barnacles were attached to the tag and they appeared to be forcing the attachment point of the tag apart. This may be one cause of tag shedding in sea turtles when the tag is improperly attached. The barnacles were collected with the tag. A new pair of tags was attached to the turtle's foreflippers. Two additional captured female olive ridley sea turtles indicated signs of tagging (scarred pads on their foreflippers) but the tags were absent. A total of four females, two males, and one undetermined sex (28 cm carapace length) olive ridley sea turtles were captured, measured, tagged, and released from the speedboat.

At 14:20 seven unidentified Frigate birds, and several Masked, *Sula dactylatra*, and Red-footed boobies, and Wedge-tailed shearwaters, were observed working the water over a school of Dorado, *Coryphaena hippurus*, chasing flying fish. At 15:25 the vessel ran into a large rain shower so search effort was suspended for the remainder of the day. The ship ran south all night.

6 December 1992

Search effort started at 05:45 and the vessel's position was 6°36'N and 85°30'W. The fish spotter in the crow's nest located a large mixed school of spinners and spotters (85% spinners, 15% spotters) at 06:31. There was a large flock of seabirds associated with the school. The dolphins ran toward a rain squall.

Helicopter flight #1:

The helicopter departed at 08:15. Capt. Madruga examined the school of spotters and spinners previously sighted from the crow's nest but did not see much tuna. At 08:23 Capt. Madruga located

another mixed school of spotters and spinners. He estimated the school was composed of 400-500 spinners, and 100 spotters. Set 12 was made on this tuna/dolphin aggregation.

Set No. 12

The purse-seine was deployed at 09:15 and the set position was 6°32'N and 85°05'W. Approximately 12 tons of yellowfin tuna were loaded in the fish wells. A sample of 19 yellowfin tuna was processed after the set was completed by the scientific field party (Table 8). Underwater video of the backdown procedure was recorded.

Helicopter flight #2:

The helicopter departed at 12:45. A large school of spotters carrying an estimated 50 tons of tuna was reported by Capt. Madruga 17.5 miles from the ships position. Set 13 was made on this school. The helicopter landed to refuel at 14:05 and departed at 14:20.

Phil Peterman and I sounded the fuel tanks at 14:20 to determine the total fuel consumption for the 30-day charter period (APPENDICES I-III).

Set No. 13

The purse-seine was deployed at 15:00 and the set position was 6°46'N and 84°41'W. Approximately 33 tons of yellowfin tuna was captured and brailed aboard the vessel. One blue marlin, *Makaira nigricans*, was caught. It was measured and its stomach contents were examined (stomach was empty). After the backdown procedure was completed, the hydraulic brake on the purse winch started to slip and threatened to release the purse line cable and the net into the water. An electric motor that pumped hydraulic fluid to hydraulic system had burned up during backdown. The chief engineer was forced to shunt hydraulic power from equipment not being used during the net retrieval to the winch and the power block in order to get the net, fish, and net skiff aboard the vessel and complete the set. The set was completed at 21:55. This mechanical breakdown made the ship incapable of conducting fishing operations because there was no spare electric motor for this particular piece of equipment. The ship ran to Puntarenas, Costa Rica, to drop off the scientific party before travelling to Panama to have the failed hydraulic pump's electric engine replaced or rewound.

7 December 1992

The NICOLE K continued to run for Puntarenas, Costa Rica, and arrived at the anchorage at 12:30. A summary of fuel used by the vessel during the 30-day charter period was prepared and FAXed to Chuck Oliver at SWFSC.

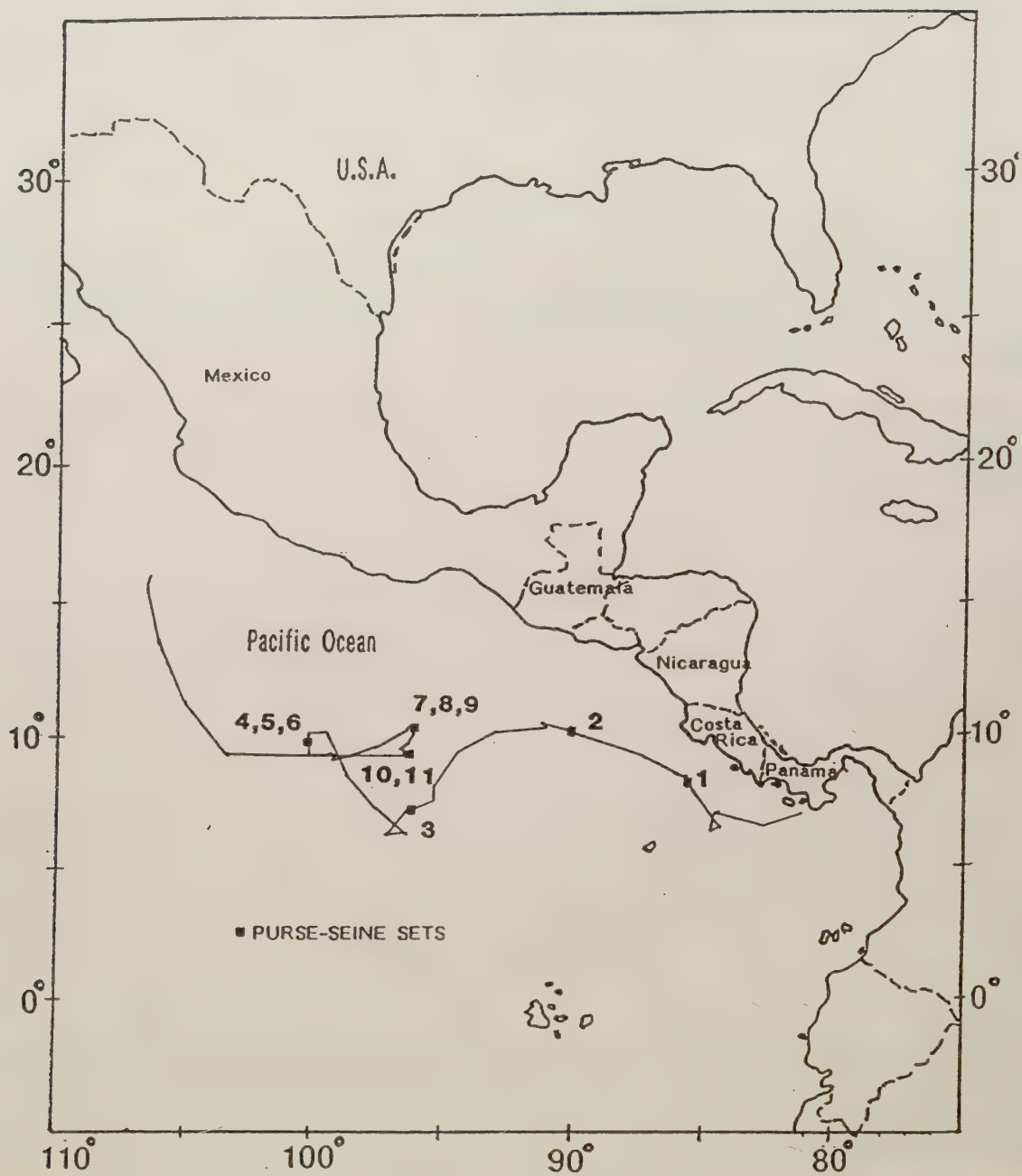


Figure 1. Map of area of operations in the eastern tropical Pacific ocean.

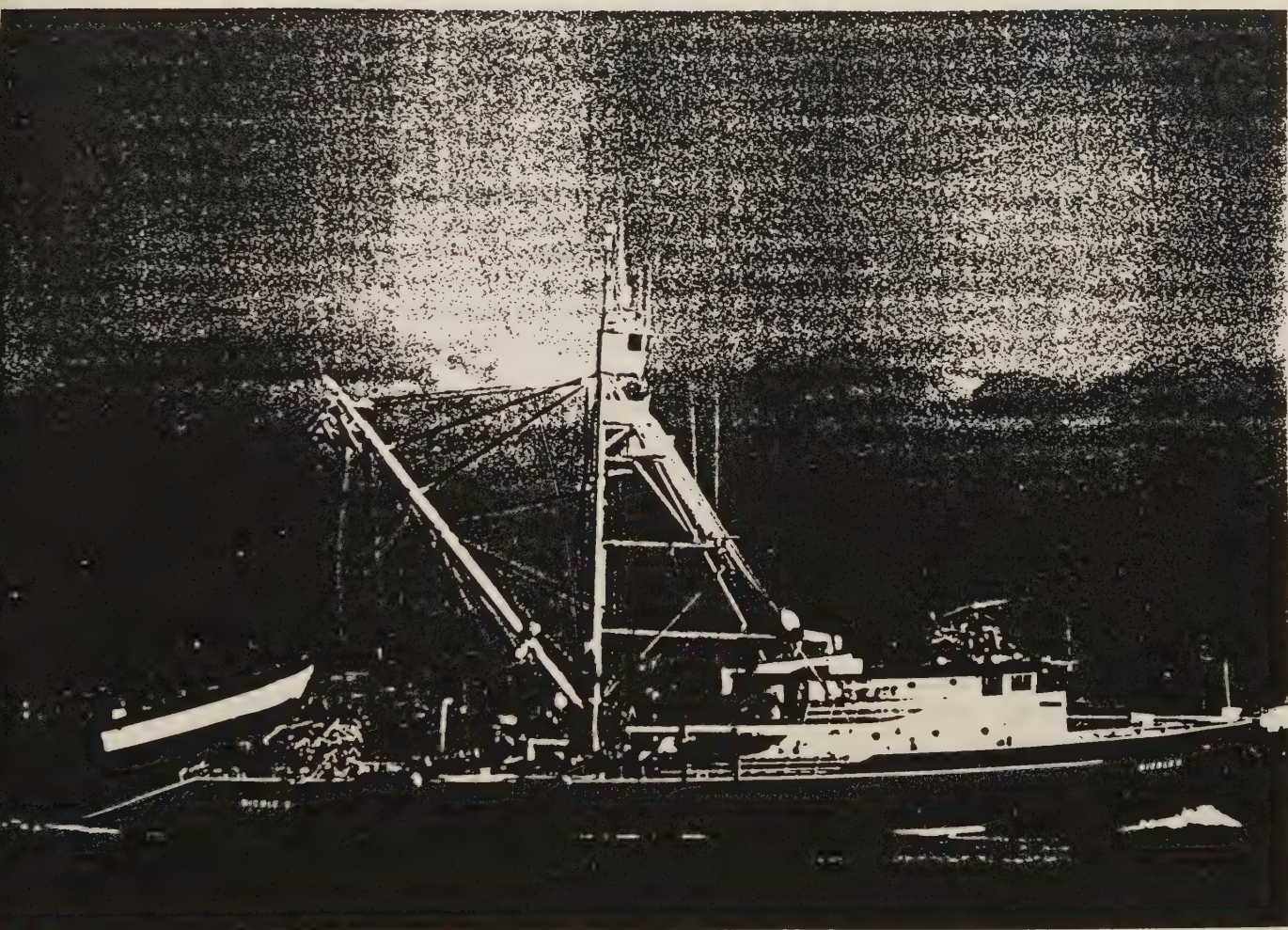


Figure 2. Photograph of the chartered tuna purse-seine vessel
NICOLE K.

Table 1. Tagging effort summarized by set for northern offshore spotted dolphin, *Stenella attenuata*, captured during the 30-day Dolphin-Safe charter.

<u>Set No. 4</u>
Date: 11/19/92
Tagged Dolphin Number: (D1)
Species (color pattern-sex): <i>Stenella attenuata</i> (fused-female)
Dorsal Fin Mounted Tracking Package: TDR/radio-transmitter
Radio Transmitter Frequency: 148.260 MHz
<u>Set No. 7</u>
Date: 11/22/92
Tagged Dolphin Number: (D2)
Species (color pattern-sex): <i>Stenella attenuata</i> (fused-female)
Dorsal Fin Mounted Tracking Package: Standard radio-transmitter
Radio Transmitter Frequency: 148.138 MHz
<u>Set No. 8</u>
Date: 11/23/92
Tagged Dolphin Number: (D3)
Species (color pattern-sex): <i>Stenella attenuata</i> (fused-male)
Dorsal Fin Mounted Tracking Package: TDR/radio-transmitter
Radio Transmitter Frequency: 148.090 MHz
Tagged Dolphin Number: (D4)
Species (color pattern-sex): <i>Stenella attenuata</i> (fused-female).
Dorsal Fin Mounted Tracking Package: Standard radio-transmitter
Radio Transmitter Frequency: 148.111 MHz
<u>Set No. 9</u>
Date: 11/24/92
Tagged Dolphin Number: (D5)
Species (color pattern-sex): <i>Stenella attenuata</i> (fused-female)
Dorsal Fin Mounted Tracking Package: TDR/radio-transmitter
Radio Transmitter Frequency: 148.300 MHz
<u>Set No. 10</u>
Date: 11/26/92
Tagged Dolphin Number: (D6)
Species (color pattern-sex): <i>Stenella attenuata</i> (fused-female)
Dorsal Fin Mounted Tracking Package: Standard radio-transmitter
Radio Transmitter Frequency: 148.190 MHz

Table 2. Field examination of *Thunnus albacares* stomach contents caught in association with northern offshore spotted dolphin, *Stenella attenuata*, during Set No. 2 on 11/11/92 at 10°29'N and 90°20'W.

Sample #	Fork length (cm)	Sex	Stomach Contents
1.	126.5	M	small fish, squid flesh
2.	96.4	M	squid beak
3.	97.2	M	empty
4.	136.6	M	squid beak, file fish spines
5.	89.2	F	fish flesh, small squid beaks
6.	126.0	M	squid beaks, small squid flesh
7.	90.5	F	empty
8.	87.1	M	squid beaks, fish flesh, isopod
9.	97.7	M	empty
10.	108.7	F	empty
11.	96.0	F	small squid beak
12.	91.2	M	empty
13.	94.4	M	beaks and flesh of small squid
14.	100.4	M	digested fish
15.	132.4	M	empty
16.	121.5	M	digested fish remains
17.	93.7	F	empty
18.	94.0	M	empty
19.	92.5	F	empty
20.	93.7	M	squid flesh
21.	116.7	M	empty
22.	99.2	F	fish flesh, small squid beaks
23.	112.2	M	empty

Table 3. Field examination of *Thunnus albacares* stomach contents caught in association with northern offshore spotted dolphin, *Stenella attenuata*, during Set No. 3 on 11/14/92 at 7°19'N and 96°13'W.

Sample #	Fork length (cm)	Sex	Stomach Contents
1.	136.0	M	1/2 digested <i>Auxis</i> sp.
2.	116.7	M	<i>Exocoetus</i> sp. (Exo.) flesh/otolith, squid beaks
3.	127.1	M	Exo. flesh/otolith
4.	127.1	M	scombrid (<i>Auxis</i> sp.), <i>Oxyporhamphus</i> sp. (Oxy.) otolith
5.	128.9	F	<i>Auxis</i> sp.
6.	131.5	M	Exo. flesh, 2 otoliths
7.	94.2	M	unid. fish remains
8.	121.8	M	<i>Auxis</i> sp.
9.	109.1	M	Exo.
10.	130.7	F	empty
11.	119.5	M	empty
12.	95.5	M	empty
13.	95.7	M	empty
14.	128.5	M	<i>Auxis</i> sp.
15.	92.9	M	empty
16.	132.0	F	empty
17.	135.2	F	fish remains
18.	152.1	F	<i>Auxis</i> sp.
19.	131.0	F	empty
20.	114.6	F	1 Exo. otolith
21.	82.5	M	empty
22.	93.0	F	empty
23.	85.5	M	empty
24.	125.8	F	Exo.
25.	123.4	F	Exo. otolith (1)
26.	98.8	M	Oxy.
27.	128.0	F	empty
28.	136.0	M	squid beak, 1 Oxy. otolith
29.	114.0	F	empty
30.	97.5	M	empty

Table 4. Field examination of *Thunnus albacares* stomach contents caught in association with northern offshore spotted dolphin, *Stenella attenuata*, during Set No. 4 on 11/19/92 at 9°52'N and 99°57'W.

Sample #	Fork length (cm)	Sex	Stomach Contents
1.	139.9	M	Portunid crab (p.c.) remains, fish vertebrae, 1 squid beak
2.	130.6	M	fish vert., 1 squid beak
3.	131.3	M	fly fish vert., p.c. remains
4.	127.8	F	p.c. parts, <i>Exocoetus</i> sp. otolith, <i>Oxyporhamphus</i> sp. remains
5.	125.9	F	flying fish otolith/flesh, p.c. parts
6.	125.5	F	fish vert., p.c. parts
7.	121.2	M	p.c. parts, Oxy. otolith, pufferfish beaks?
8.	130.8	M	p.c. parts, Exo. parts
9.	131.7	M	p.c., flying fish flesh
10.	134.0	M	fish vert.
11.	134.3	M	p.c. Oxy. otolith
12.	126.8	M	fish mush, squid beak
13.	133.4	M	fish vert.
14.	123.9	M	p.c., fish vert., squid beak
15.	143.2	M	p.c. fish vert.
16.	143.8	M	fish vert.
17.	133.7	M	empty
18.	124.6	M	fish flesh
19.	130.4	M	flying fish parts
20.	136.5	F	p.c., flying fish parts, squid beak
21.	130.5	F	empty
22.	130.6	M	empty

Table 5. Field examination of *Thunnus albacares* stomach contents caught in association with northern offshore spotted dolphin, *Stenella attenuata*, during Set No. 8 on 11/23/92 at 10°28'N and 96°20'W.

Sample #	Fork length (cm)	Sex	Stomach Contents
1.	127.0	F	crab parts, fish vert.
2.	95.6	F	crab parts
3.	91.3	F	empty
4.	94.5	M	crab parts, <i>Auxis</i> sp.-like vert.
5.	100.0	F	empty
6.	84.2	M	crab parts
7.	133.9	M	crab parts (1)
8.	120.9	F	crab parts
9.	135.8	M	" " (4 individuals)
10.	94.9	F	" " (6 indiv.)
11.	132.3	M	" " , pair of squid beaks
12.	93.8	F	" "
13.	98.7	F	" " (approx. 5)
14.	112.6	M	" "
15.	155.7	M	" " (approx. 12)
16.	129.5	M	" " (approx. 8)
17.	135.2	M	" " (1)
18.	123.2	F	" "

Table 6. Field examination of *Thunnus albacares* stomach contents caught in association with northern offshore spotted dolphin, *Stenella attenuata*, during Set No. 9 on 11/24/92 at 9°58'N and 97°04'W.

Sample #	Fork length (cm)	Sex	Stomach Contents
1.	154.0	M	<i>Auxis</i> sp.
2.	128.6	F	3 <i>Auxis</i> sp.
3.	126.6	M	4 <i>Auxis</i> sp.
4.	132.6	M	3 <i>Auxis</i> sp.
5.	135.7	M	1 scombrid (non- <i>Auxis</i> sp.)
6.	71.6	F	fish vert., crab
7.	138.5	M	3 <i>Auxis</i> sp.
8.	110.6	M	<i>Auxis</i> sp.
9.	113.8	M	5 <i>Auxis</i> sp.
10.	92.7	M	<i>Auxis</i> sp.
11.	97.1	F	fish vert.
12.	138.3	M	6 <i>Auxis</i> sp.
13.	88.4	M	1 crab, 1 squid beak
14.	79.6	F	fish vert.
15.	117.2	M	crab, fish vert., bryozoan
16.	110.5	F	1 <i>Auxis</i> sp., 1 crab
17.	95.9	F	2 <i>Auxis</i> sp.
18.	132.2	M	2 <i>Auxis</i> sp.
19.	136.5	M	2 <i>Auxis</i> sp., squid beak

Table 7. Field examination of *Thunnus albacares* stomach contents caught in association with northern offshore spotted dolphin, *Stenella attenuata*, and eastern spinner dolphin, *Stenella longirostris*, during Set No. 10 on 11/26/92 at 9°06'N and 96°59'W.

Sample #	Fork length (cm)	Sex	Stomach Contents
1.	137.1	M	fish remains
2.	132.5	M	empty
3.	133.9	M	fish remains
4.	134.5	M	" "
5.	144.3	M	fish remains, fresh cowfish
6.	132.3	M	flying fish flesh, 2 squid beaks.
7.	138.8	M	cowfish
8.	131.0	F	<i>Oxyporhamphus</i> sp. remains
9.	141.2	F	4 Oxy., 1 squid beak, puff fish beak
10.	135.0	M	1 Oxy.
11.	142.4	M	pufferfish beak
12.	127.2	F	flying fish flesh
13.	129.4	M	1 Oxy., fish flesh
14.	134.6	M	1/2 digested <i>Exocoetus</i> sp.
15.	129.1	F	flying fish flesh
16.	126.1	F	1/2 digested Exo.
17.	135.2	M	fish flesh
18.	127.6	M	2 flying fish remains
19.	128.9	F	1 squid beak, 1 puffer fish beak.
20.	133.7	F	empty
21.	127.5	F	1 swimming crab

Table 8. Field examination of *Thunnus albacares* stomach contents caught in association with northern offshore spotted dolphin, *Stenella attenuata*, during Set No. 12 on 12/6/92 at 6°32'N and 85°05'W.

Sample #	Fork length (cm)	Sex	Stomach Contents
1.	126.8	F	(2) 1/2 digested <i>Oxyporhamphus</i> sp., squid beak, 1 crab
2.	75.1	F	small squid beaks
3.	80.6	F	" "
4.	122.4	M	3 large pelagic crabs, 1 Oxy., 1 isopod.
5.	81.0	F	small squid lenses
6.	140.0	F	6 large pelagic crabs/fresh
7.	118.1	M	1 unid. flying fish otolith, squid lenses
8.	133.6	F	5 pelagic crabs, (4) 1/2 digested Oxy.
9.	144.7	M	(1) 1/2 digested Oxy.
10.	81.8	F	crab parts, squid beaks
11.	124.0	M	3 pelagic crabs, 1 piece of plastic
12.	126.4	M	1 fresh pelagic crab
13.	113.9	F	(1) 1/2 dig. Oxy., squid beak
14.	116.6	M	2 pelagic crabs, 1 Oxy. isopod, 2 Oxy.
15.	123.7	M	1 lg. pelagic crab
16.	139.2	M	4 lg. pelagic crabs
17.	130.2	F	2 pelagic crabs, 1 Oxy.
18.	114.5	F	empty
19.	119.9	F	empty

Table 9. Summary of olive ridley sea turtle, *Lepidochelys olivacea*, captures and tag placements during the 30-day Dolphin-Safe charter of NICOLE K.

Olive Ridley Sea Turtle Capture/Tag Placement Operations

Date: 11/13/92 (All *Lepidochelys olivacea*)

<u>Position</u>	<u>Sex</u>	<u>Specimen #</u>	<u>Tag #'s</u>
9°02'N 95°24'W	M	057	GO310, GO311
8°55'N 95°26'W	F	058	G)312, GO313
8°50'N 95°27'W	Unk.	059	GO314, GO315
8°43'N 95°29'W	M	060	GO316, GO317

Date: 11/17/92 (All *Lepidochelys olivacea*)

<u>Position</u>	<u>Sex</u>	<u>Specimen #</u>	<u>Tag #'s</u>
7°32'N 97°50'W	F	061	GO318, GO319

Date: 11/21/92 (All *Lepidochelys olivacea*)

<u>Position</u>	<u>Sex</u>	<u>Specimen #</u>	<u>Tag #'s</u>
9°31'N 98°35'W	F	062	GO328, GO329
9°32'N 98°35'W	F	063	GO330, GO331
9°35'N 98°34'W	F	064	GO324, GO325
9°30'N 98°35'W	F	065	GO326, GO327
9°35'N 98°37'W	M	066	GO322, GO323
9°35'N 98°42'W	M	067	GO320, GO321

Date: 12/5/92 (All *Lepidochelys olivacea*)

<u>Position</u>	<u>Sex</u>	<u>Specimen #</u>	<u>Tag #'s</u>
7°21'N 89°10'W	F	068	GO332, GO333

*Previously tagged on second pad of each foreflipper, tags had ripped out.

7°20'N 89°05'W	F	069	GO334, GO335
----------------	---	-----	--------------

*Single tag present at capture: #Y7203/*UCR

7°19'N 89°04'W	Unk.	070	GO336, GO337
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*Possible scars from previous tagging, tag apparently ripped out from between pads 1-2 on left foreflipper.

7°18'N 88°59'W	F	071	GO338, GO339
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7°17'N 88°58'W	F	072	GO340, GO341
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7°18'N 88°59'W	M	073	GO342, GO343
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7°17'N 88°59'W	M	074	GO344, GO345
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*University of Costa Rica

APPENDIX I
FUEL LOG (DAY 1) OF THE 30-DAY CHARTER

DATE: 11/6/92

TIME: 1300

DAYS RUNNING: 0

<u>TANK</u>	<u>HEIGHT FULL</u>	<u>CAPACITY (GAL.)</u>	<u>ACTUAL GAL/HT</u>
Bow day tank	full	14,000	14,000
Port Wing	5'10"	7,000	7,000 5'10"
Star Wing	5'10"	6,000	6,000 5'10"
#1 Port DB	2'4"	4,200	4,200 2'10"
#1 Star DB	2'4"	4,200	4,200 2'10"
#2 Port DB	3'0"	3,500	3,500 3'9"
#2 Star DB	3'0"	3,500	3,500 3'5"
#3 Port DB	3'8"	4,650	1,200 1'4"
#3 Star DB	3'8"	4,650	1,200 1'6"
#4 Port DB	3'1"	2,700	0 3'2"
			(2'1"water)
#4 Star DB	3'1"	2,700	0
#5 C DB	2'7"	3,600	3"
#1 Fishwell P	top	16,500	16,500 Full
#1 Fishwell S	top	16,500	16,500 Full
Stabilizer	6'0"	28,000	15,000 3'4"
Aux. Fuel Tank	7'2"	800	650 5'9"
Avgas.cyl S	3'5"	2,500	0 empty
Avgas.cyl P	3'5"	2,500	1,500 2'4"
Avgas.Aft WD	5'6"	1,700	1,700 4'10"
Avgas.Fwd WD	5'6"	1,600	1,600 5'2"

DIESEL FUEL TOTAL = 94,400 GALLONS

AVGAS TOTAL = 5,1000 GALLONS

AVERAGE DIESEL FUEL USE PER DAY = N/A

APPENDIX II
FUEL LOG (DAY 30) OF THE 30-DAY CHARTER

DATE: 12/6/92

TIME: 1430

DAYS RUNNING: 30

<u>TANK</u>	<u>HEIGHT FULL</u>	<u>CAPACITY (GAL.)</u>	<u>ACTUAL GAL/HT</u>
Bow day tank	full	14,000	14,000 full
Port Wing	5'10"	7,000	7,000 5'10"
Star Wing	5'10"	6,000	6,000 5'10"
#1 Port DB	2'4"	4,200	4,200 2'10"
#1 Star DB	2'4"	4,200	4,200 3'2"
#2 Port DB	3'0"	3,500	0 5"
#2 Star DB	3'0"	3,500	3,500 4'0"
#3 Port DB	3'8"	4,650	0 0"
#3 Star DB	3'8"	4,650	0 0"
#4 Port DB	3'1"	2,700	0 0"
#4 Star DB	3'1"	2,700	0 0"
#5 C DB	2'7"	3,600	0 0"
#1 Fishwell P		16,500	slack 0"
#1 Fishwell S		16,500	slack 0"
*Stabilizer	6'0"	28,000	0 0"
Aux. Fuel Tank	7'2"	800	800 7'2"
Avgas.cyl S	3'5"	2,500	0 empty
Avgas.cyl P	3'5"	2,500	0 4"
Avgas.Aft WD	5'6"	1,700	775 3'1"
Avgas.Fwd WD	5'6"	1,600	1,500 5'1"

TOTAL DIESEL FUEL REMAINING = 39,700 GALLONS

TOTAL AVGAS REMAINING = 2,275 GALLONS

APPENDIX III
SUMMARY OF FUEL USE DURING THE 30-DAY CHARTER

6 November, 1992 - 6 December, 1992

Date: November 6, 1992

Time tanks sounded: 1400

Diesel fuel stored in tanks = 94,400 gallons

Avgas fuel stored in tanks = 5,1000 gallons

Average diesel fuel use per day = N/A

Date: November 12, 1992

Time tanks sounded: 1400

Diesel fuel stored in tanks = 83,450 gallons

Diesel fuel used = 10950 gallons

Average diesel fuel use per day = 1,666 gallons per day.

Avgas stored in tanks = 4,800 gallons

Avgas used by helicopter = 257 gallons

Avgas used by speedboats = 43 gallons

Date: November 19, 1992

Time tanks sounded: 1400

Diesel fuel stored in tanks = 75,400 gallons

Diesel fuel used = 8,050 gallons

Average diesel fuel use per day = 1.150 gallons per day

Avgas stored in tanks = 4,300 gallons

Avgas used by helicopter = 357 gallons

Avgas used by speedboats = 143 gallons

Date: November 26, 1992

Time tanks sounded: 1200

Diesel fuel stored in tanks = 65,850 gallons

Diesel fuel used = 9,550 gallons

Average diesel fuel use per day = 1,365 gallons

Avgas stored in tanks = 3,450 gallons

Avgas used by helicopter = 582 gallons

Avgas used by speedboats = 268 gallons

Date: December 3, 1992

Time tanks sounded: 2100

Diesel fuel stored on tanks = 46,650 gallons

Diesel fuel used = 19,200 gallons

Average diesel fuel use per day = 2,743 gallons per day

Avgas stored in tanks = 3,150 gallons

Avgas used by helicopter = 227 gallons

Avgas used by speedboats = 73 gallons

Date: December 6, 1992

Time tanks sounded: 1430

Diesel fuel stored in tanks = 39,700 gallons

Diesel fuel used = 6,800 gallons

Average diesel fuel use per day = 2,266 gallons

Avgas stored in tanks = 2,275 gallons (measurement effected by the trim of the boat, did not use 1175 gallons in three days)

Avgas used by helicopter = 144.5 gallons

MOPS SEA TURTLE LIFE HISTORY FORM

1102

TIME	LATITUDE	LONGITUDE	SW
1102	09.02	107.52	9

0.6 k.

RECORD	YR	MO	DAY
147.7	92	11	13

CRUISE #

0.57

OLIVE RIDLEY ✓	GREEN / BLACK ()	LEATHERBACK ()
HAWKBILL ()	LOGGERHEAD ()	UNIDENTIFIED ()

LEFT COSTAL SCUTES

[illegible]

SPACE LENGTH	CURVED	STRAIGHT LINE
0.70.5	0.61.0	

UPPER WIDTH	CURVED	STRAIGHT LINE
0.72.4	1.58.0	

DATE - TIME	01/16/23
DATA (Ver) - TIME	11:11

STRAIGHT LINE
D WIDTH

WIVOR AT CAPTURE:

2) MATING

卷一百一十五

SAMPLES COLLECTED?

Yellow 1 leaf

NOTES: Use back of form for notes on any abnormalities, diseases, epizoots, signs of shark attack, and the diagnosis characterized when identifying specimens not brought aboard.

[illegible]

11.11.07

The last 7 trials, were all complete in the same general vicinity — all were healthy, some were climbing skeletons still and appeared to have been feeding; one was tagged — another had lost three legs; under study in important feeding area for a local studied western bumble.

NOVA

MOPS SEA TURTLE LIFE HISTORY FORM

U.S. DEPT. OF COMMERCE

CRUISE # 1477 RECORD 0518 YEAR 92 MONTH 12 DAY 13 TIME 1130 LATITUDE 01.51 LONGITUDE 109.52 BW 16
 SPECIES: OLIVE RIDLEY ☒ HAWKSBILL ☐
 LEATHERBACK ☐ UNIDENTIFIED ☐
 GREEN/BLACK ☐ LOGGING HEAD ☐

IDENTIFICATION: NUMBER OF LEFT COSTAL SCUTES ☐ RIGHT COSTAL SCUTES ☐ VERTICAL SCUTES ☐ INFRAMARGINAL SCUTES ☒		OVERLAPPING SCUTES? YES ☐ NO ☒ UNK ☐ INFRAMARGINAL PORES? YES ☒ NO ☐ UNK ☐ 1 PAIR PREFRONTAL SCUTES? YES ☒ NO ☐ UNK ☐ LACKS BONY SHELL? YES ☒ NO ☐ UNK ☐ DORSAL COLORATION: ORANGE/RED ☐ GRAYISH ☐ UNKNOWN ☐	
DIMENSIONS (cm): CARAPACE LENGTH <u>97</u> CURVED <u>106.4</u> STRAIGHT LINE <u>7</u> CARAPACE WIDTH <u>1</u> CURVED <u>1</u> STRAIGHT LINE <u>1</u> TAIL LENGTH <u>Ca</u> CARAPACE-TP <u>120</u> CLOACA (Wing-TP) <u>1</u> PLASTRON-TP <u>1</u> HEAD WIDTH <u>1</u> STRAIGHT LINE <u>1</u> WEIGHT (kg) <u>1</u>		ASSOCIATED WITH PLASTIC OR OTHER PLASTIC: YES ☐ NO ☒ UNK ☐ A. ASSOCIATED WITH PLASTIC: DISTANCE: <u>1</u> m. ENTANGLED IN PLASTIC? YES ☐ NO ☒ UNK ☐ B. ASSOCIATED WITH PLASTIC: SPECIES: <u>1</u> NUMBER: <u>1</u> DISTANCE (m): <u>1</u> 1 <u>1</u> 2 <u>1</u> 3 <u>1</u>	
BEHAVIOR AT CAPTURE: ☒ 1) BASKING ☐ 2) WADING ☐ 3) SWIMMING ☐ 4) FEEDING ☐ 5) OTHER (describe)		TAGS: 1. TAGS PRESENT WHEN CAPTURED: YES ☐ NO ☒ UNK ☐ PLASTIC ☐ METAL ☐ TAG # <u>160312</u> TAG # <u>160313</u> ADDRESS: <u>1</u> 2. TAG(S) REMOVED: YES ☐ NO ☒ PLASTIC ☐ METAL ☒ 3. TAG(S) APPLIED BY OBSERVER: TAG # <u>160312</u> TAG # <u>160313</u> SAMPLES COLLECTED? YES ☐ NO ☒	

TAIL MEASUREMENTS CARAPACE-TP DORSAL VENTRAL	PLASTRON-TP / VENT-TP PLASTRON-TP VENT-TP	CARAPACE CARAPACE LENGTH WIDTH
ENVIRONMENTAL DATA AIR TEMP °C <u>1</u> BLACK BULB °C <u>1</u> SEA SURF TEMP °C <u>1</u> WEATHER CONDITION: ☐ SUN ☐ OVERCAST ☐ RAIN/SCALLS ☐ FOG ☐ CLOUD COVER ☐		SCUTES DORSAL VIEW VENTRAL VIEW INFRAMARGINAL SCUTES MORE THAN ONE PAIR PREFRONTAL SCUTES ONE PAIR PREFRONTAL SCUTES

Healthy ♂ - is impaled(?) all over post portion of carapace.
 Good color before & after fat; heavy!

NOTES: Use back of form for notes on any abnormalities, diseases, epibiosis, signs of shark attack, and the diagnostic characteristics observed when identifying specimens not brought aboard.

U.S. DEPT. OF COMMERCE

CRUISE #	RECORD	YR	MO	DAY	TIME	LATITUDE	LNG	LONGITUDE	SW
1,477	0,59	9,2	11	13	1.195	0.850W	02.527	7	☒

11.6 K.

R.L. Attner

SPECIES:		GREEN/BLACK ()		LEATHERBACK ()	
(check one)		LOGGERHEAD ()		UNIDENTIFIED ()	
☒ OLIVE RIDLEY (✓)					
☐ HAWKSBILL ()					

IDENTIFICATION:	NUMBER OF: LEFT COSTAL SCUTES	RIGHT COSTAL SCUTES	VERTEBRAL SCUTES	INFRAORBITAL SCUTES
OVERLAPPING SCUTE?	YES () NO (X) UNK ()			
INFRAORBITAL PORE?	YES (X) NO () UNK ()			
1 PAIR FRONTAL SCUTES?	YES () NO (X) UNK ()			
LACKS BONY SHELL	YES (X) NO () UNK ()			
NOSE ON ORBIT:	ORANGE / RED () GRAYISH / UNKNOWN ()			

DIMENSIONS (cm):

0485

CARAPACE LENGTH

A ASSOCIATED WITH FLOTEAM:

CURVED _____

YES NO LINK YES NO LINK

DISTANCE _____ IN ENTANGLED IN FLOTTANT

11/16 1/2

STRAIGHT LINE

B. ASSOCIATED WITH PAIN:

CARAPACE WIDTH	SPECIES	NUMBER	DISTANCE (m)

庄

STRAIGHT LINE

2

2

ALUMINUM 876

CARPACE-TP

CLOCKWORK (MIND) - TIP

TAGS:

YES NO UNK

PLASTIC

4

	TAG #	TAG #	TAG #	METAL
1. TAGS PRESENT WHEN CAPTURED:				

USE IN WATER

POSITION • 18

STRAIGHT LINE

Address: _____

WEIGHT (kg)	2. TADPOLE REMOVED:	YES	NO
			☒

BEHAVIOR AT CAPTURE:

2 TAGS APPLIED BY OBSERVER:

PLASTIC ☐ METAL ☒

	TAG #	TAG #
(1) BASHING		

DRAWINGS & EXPLANATIONS
 6,0,3,1,4 | 6,0,3,1,5

4) FEEDING	SALES COLLECTION?	YES	NO

[illegible]

NOTES: Use back of form for notes on any abnormalities, diseases, epizoots, signs of stragg attack, and the diagnostic characteristics observed when identifying specimens not brought aboard.

United States National Oceanic and Atmospheric Administration



SCUTES VENTRAL VIEW

POSTERIAL VIEW

[illegible]

EAT THE FAT BACK

一一八

OFFICE

THE PROBLEM

848

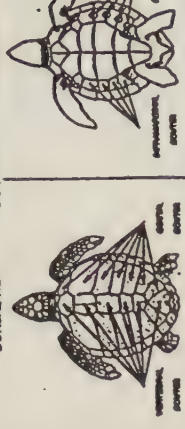


Diagram illustrating the difference in prefrontal scales between a male and a female snake. The male snake (top) has more than one pair of prefrontal scales, while the female snake (bottom) has only one pair.

Healthy friends (serappy + happy) in making scenes

HOW

MOPS SEA TURTLE LIFE HISTORY FORM

U.S. DEPT. OF COMMERCE

W. L. K.

RECORD

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SPECIES: OLIVE RIDLEY ☒ HAWKSBILL ☐

GREEN/BLACK ☐ LEATHERBACK ☐

LOGGERHEAD ☐ UNIDENTIFIED ☐

OVERLAPPING SCUTES? YES ☐ NO ☒ UNK ☐

INFRA-MARGINAL PORES? YES ☒ NO ☐ UNK ☐

1 PAIR PREFRONTAL SCALES? YES ☐ NO ☒ UNK ☐

LACKS BONY SHELL YES ☐ NO ☒ UNK ☐

DORSAL COLORATION: ORANGE/RED ☐ GRAYISH ☒ UNKNOWN ☐

ASSOCIATED WITH FLOTSAM OR OTHER FLUKE: YES ☐ NO ☒ UNK ☐

A. ASSOCIATED WITH FLUKE: DISTANCE _____ IN ENTANGLED IN FLOTSAM? ☐ YES ☒ NO ☐

B. ASSOCIATED WITH FLUKE: SPECIES _____ NUMBER _____ DISTANCE (M) _____

1 _____

2 _____

3 _____

TAGS: 1. TAGS PRESENT WHEN CAPTURED: ☐ PLASTIC ☐ METAL ☐

TAG # _____

ADDRESS: _____

2. TAGS REMOVED: YES ☐ NO ☒

3. TAGS APPLIED BY OBSERVER: TAG # _____ PLASTIC ☐ METAL ☒

TAG # _____

SAMPLES COLLECTED? YES ☐ NO ☒

BEHAVIOR AT CAPTURE:

1. BARSING ☒

2. HATING ☐

3. SWIMMING ☐

4. FEEDING ☐

5. OTHER (describe) ☐

NOTES: Use back of form for notes on any abnormalities, diseases, epibioses, signs of shark attack, and the diagnostic characteristics observed when identifying specimens not brought aboard.

IDENTIFICATION:

NUMBER OF LEFT COSTAL SCUTES ☐

RIGHT COSTAL SCUTES ☐

VERTICAL SCUTES ☐

INFRA-MARGINAL SCUTES ☒

DIMENSIONS (cm):

CARAPACE LENGTH ☒ 67

CURVED ☐ 67.0

STRAIGHT LINE ☐

CARAPACE WIDTH ☐

CURVED ☐

STRAIGHT LINE ☐

TAIL LENGTH ☐

CARAPACE-TP ☐

CLOACA (WING-TP) ☐

PLASTRON-TP ☐

HEAD WIDTH ☐

STRAIGHT LINE ☐

WEIGHT (KG) ☐

FLUSTRON-TP / VENT-TP

TAIL MEASUREMENTS

ENVIRONMENTAL DATA

SCUTES

VENTRAL VIEW

CARAPACE

Ty apparently ripped out from between peds 1-2 on left flippers appeared to him old missing scars. Sighting of soft scutes.

U.S. DEPT. OF COMMERCE

TAIL MEASUREMENTS CARAPACE TIP DORSAL VENTRAL	PLASTION TIP / VENT TIP VENT TIP PLASTION TIP	CARAPACE CARAPACE TIP WIDTH CAUDAL LENGTH	SCUTES DORSAL VIEW VENTRAL VIEW
ENVIRONMENTAL DATA AIR TEMP ° SEA SURF TEMP ° BLACK BULB ° WEATHER CONDITION () SUN () OVERCAST () RAIN / SQUALLS () FOG CLOUD COVER NO DEPTH	ONE PAIR PREVENTRAL SCALES ONE PAIR PREVENTRAL SCALES	ONE PAIR PREVENTRAL SCALES ONE PAIR PREVENTRAL SCALES	SCUTES DORSAL VIEW VENTRAL VIEW
ENVIRONMENTAL DATA AIR TEMP ° SEA SURF TEMP ° BLACK BULB ° WEATHER CONDITION () SUN () OVERCAST () RAIN / SQUALLS () FOG CLOUD COVER NO DEPTH	ONE PAIR PREVENTRAL SCALES ONE PAIR PREVENTRAL SCALES	ONE PAIR PREVENTRAL SCALES ONE PAIR PREVENTRAL SCALES	SCUTES DORSAL VIEW VENTRAL VIEW

ENVIRONMENTAL DATA			
AIR TEMP °C	BLACK BULB °C	SEA SURF TEMP °C	
WEATHER CONDITION		W/D DEPTH	CLOUD COVER ☐
() SUN () OVERCAST () RAIN / SQUALLS () FOG			

They fallen with prominent spines on venter. Sutures and post marginal suture. Black pitules still prominent on all venter areas colored plation suture. Composite gray Cell the adults have had green composites with underside yellowish, often flushed pink on soft areas. Several cubs but no female growth. A very scrappy/bulky individual had a little trouble diving as we tried to catch it - just like adults are when they're new to the surface for a while.

NOTES: Use back of form for notes on any abnormalities, diseases, epizoots, signs of shark attack, and the diagnostic characteristics observed when identifying specimens not brought aboard.

NOVA

SEA TURTLE LIFE HISTORY FORM

U.S. DEPT. OF COMMERCE

NAME Mick RECORD 1,4,7,7,0,6,2 CRUISE # 1030 YEAR 1992 MONTH 11 DAY 21 LATITUDE 33° 10' N LONGITUDE 81° 15' W

SPECIES: OLIVE RIDLEY ☒ HAWKSBILL ☐ GREEN/BLACK ☐ LEATHERBACK ☐ UNIDENTIFIED ☐ LOGS/HEAD ☐

IDENTIFICATION: NUMBER OF LEFT COSTAL SCUTES 6 RIGHT COSTAL SCUTES 6 VENTRAL SCUTES 0 INFRAMARGINAL SCUTES 4

OVERLAPPING SCUTES? YES ☐ NO ☒ UNK ☐ INFRAMARGINAL PORES? YES ☐ NO ☒ UNK ☐ 1 PAIR PREFRONTAL SCUTES? YES ☐ NO ☒ UNK ☐ LACRIMARY BONY SHELL YES ☐ NO ☒ UNK ☐ DORSAL COLORATION: ORANGE/RED ☐ GRAYISH ☐ UNKNOWN ☐

DIMENSIONS (cm): CARAPACE LENGTH 167.2 CURVED 167.2 STRAIGHT LINE 167.2 CARAPACE WIDTH 167.2 CURVED 167.2 STRAIGHT LINE 167.2 TAIL LENGTH 10.5 CARAPACE - TIP 10.5 CLOACA (mm) - TIP 10.5 PLASTRON - TIP 10.5 HEAD WIDTH 10.5 STRAIGHT LINE 10.5 WEIGHT (kg) 10.5

ASSOCIATED WITH FLOTSAIL OR OTHER FAUNA: YES ☐ NO ☒ UNK ☐ A. ASSOCIATED WITH FLOTSAIL: DISTANCE: 10 m ENTANGLED IN FLOTSAIL? YES ☐ NO ☒ UNK ☐ B. ASSOCIATED WITH FAUNA: SPECIES 1 NUMBER 1 DISTANCE (m) 1

TAGS: 1. TAGS PRESENT WHEN CAPTURED: YES ☐ NO ☒ UNK ☐ PLASTIC ☐ METAL ☐ TAG # 16,0,3,2,18

ADDRESS: 16,0,3,2,18

2. TAGS REMOVED: YES ☐ NO ☒ UNK ☐ PLASTIC ☐ METAL ☐ TAG # 16,0,3,2,18

3. TAGS APPLIED BY OBSERVER: TAG # 16,0,3,2,18

BEHAVIOR AT CAPTURE: ☒ BASKING ☐ SWIMMING ☐ FEEDING ☐ OTHER (describe) 16,0,3,2,18

SAMPLES COLLECTED? YES ☐ NO ☒ UNK ☐

NOTES: Use back of form for notes on any abnormalities, diseases, epibionts, signs of shark attack, and the diagnostic characteristics observed when identifying specimens not brought aboard.

TAIL MEASUREMENTS: CARAPACE - TIP 167.2 DORSAL 167.2 VENTRAL 167.2

ENVIRONMENTAL DATA: AIR TEMP 20 BLACK BULL 20 SEA SURF TEMP 20 WEATHER CONDITION: SUN ☐ OVERCAST ☐ RAIN/SCALLS ☐ FOG ☐

PLASTRON - TIP / VENT - TIP 167.2 DORSAL VIEW 167.2 VENTRAL VIEW 167.2

SCUTES: DORSAL VIEW 167.2 VENTRAL VIEW 167.2

CARAPACE: CARAPACE LENGTH 167.2 CARAPACE WIDTH 167.2

Female adult making surgery, by was on left flipper between 1st & 2nd scute - I removed it because it was not properly applied and about to fall off and it was heavily infected with soft keratosis. She was also showing gelatinous material and probably had been feeding. At the time, quite often when you pick them up, they come out of the water, if you tip them up, they pour out! See under and sometimes gelatinous material. I think they feed underwater and probably take in a lot of water. These animals probably pupilled in their throat, probably allow them to pass the water back out without passing the food with it - a steamer system.

SEA TURTLE LIFE HISTORY FORM

U.S. DEPT. OF COMMERCE

V. 6.6 h.

CRUISE #

RECORD

YR

MO

DAY

TIME

LATITUDE

LONGITUDE

E/W

LEATHERBACK ()

UNIDENTIFIED ()

GREEN / BLACK ()

LOGGERHEAD ()

HAWKSBILL ()

OLIVE RIDLEY ()

SPECIES:

(check one)

1,4,7,7,10,6,3

9,2,1,1,2,1

1040

09,3,2,1,0,9,8,3,5

1040

09,3,2,1,0,9,8,3,5

09,3,2,1,0,9,8,3,5

09,3,2,1,0,9,8,3,5

09,3,2,1,0,9,8,3,5

09,3,2,1,0,9,8,3,5

09,3,2,1,0,9,8,3,5

09,3,2,1,0,9,8,3,5

09,3,2,1,0,9,8,3,5

09,3,2,1,0,9,8,3,5

09,3,2,1,0,9,8,3,5

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09,3,2,1,0,9,8,3,5

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09,3,2,1,0,9,8,3,5

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09,3,2,1,0,9,8,3,5

09,3,2,1,0,9,8,3,5

09,3,2,1,0,9,8,3,5

09,3,2,1,0,9,8,3,5

IDENTIFICATION:

NUMBER OF LEFT COSTAL SCUTES

RIGHT COSTAL SCUTES

VERTICAL SCUTES

INFRAVENTRAL SCUTES

OVERLAPPING SCUTES?

INFRAVENTRAL FOREST?

PAIR PREFRONTAL SCUTES?

LACKS BONY SHELL

DORSAL COLORATION: ORANGE/RED () GRAYISH () UNKNOWN ()

ASSOCIATED WITH PLOTTING OR OTHER FAUNA: YES () NO ()

A. ASSOCIATED WITH PLOTTING: YES () NO ()

B. ASSOCIATED WITH FAUNA: YES () NO ()

DISTANCE: _____ m

ENTANGLED IN PLOTTING? YES () NO ()

SPECIES

NUMBER

DISTANCE (m)

1

2

3

TAGS:

1. TAGS PRESENT WHEN CAPTURED: YES () NO ()

TAG #

PLASTIC ()

METAL ()

ADDRESS:

TAG #

TAG #

TAG #

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TAG #

BEHAVIOR AT CAPTURE:

1) BASKING

2) WAITING

3) SWIMMING

4) FEEDING

5) OTHER (describe)

SAMPLES COLLECTED? YES () NO ()

YES () NO ()

YES () NO ()

YES () NO ()

YES () NO ()

YES () NO ()

YES () NO ()

YES () NO ()

TAIL MEASUREMENTS

CARAPACE-TP

DORSAL

VENTRAL

PLASTRON-TP / VENT-TP

PLASTRON-TP

VENT-TP

CARAPACE LENGTH

CARAPACE WIDTH

CARAPACE-TP

VENTRAL VIEW

SCUTES

DORSAL VIEW

SCUTES

DORSAL VIEW

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DORSAL VIEW

SCUTES

ENVIRONMENTAL DATA

AIR TEMP °C

BLACK BULL °C

SEA SURF TEMP °C

NO DEPTH

WEATHER CONDITION

OVERCAST

SUN

RAIN / SQUALLS

FOG

CLOUD COVER

CLOUD COVER

CLOUD COVER

CLOUD COVER

CLOUD COVER

CLOUD COVER

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CLOUD COVER

Settling at soft Seacolor - fishy but a little thingy good

color - previously tagged on second pod out from each for a few

Set tags had ripped out; had not appeared to be old marking

Seems: dealing gelatinous stuff - probably had been feeding

Lulu

NOTES: Use back of form for notes on any abnormalities, diseases, signs of shark attack, and the diagnostic characteristics observed when identifying specimens not brought aboard.

U.S. DEPT. OF COMMERCE

SPECIES: (check one)	OLIVE RIDLEY ()	HAWKSBILL ()	GREEN / BLACK ()	LOGGERHEAD ()	LEATHERBACK ()	UNIDENTIFIED ()
IDENTIFICATION:						
NUMBER OF: LEFT COSTAL SCUTES	5				OVERLAPPING SCUTES? YES () NO () ☒ UNK ()	
RIGHT COSTAL SCUTES	5				INFRAAPICAL POROS? YES () NO () ☒ UNK ()	
VENTRAL SCUTES	1				1 PAIR PREFRONTAL SCUTES? YES () NO () ☒ UNK ()	
INFRAAPICAL SCUTES	4				LACKS BONY SHELL YES () NO () ☒ UNK ()	
					DORSAL COLORATION: ORANGE / RED () GRAYISH () ☒ BROWN ()	

DIMENSIONS (cm):		ASSOCIATED WITH FLUTBAK OR OTHER FAUNA:		YES	NO	LINK
CARPAPACE LENGTH		A. ASSOCIATED WITH FLUTBAK	WITH FLUTBAK OR OTHER FAUNA:	YES	NO	LINK
CURVED		DISTANCE: _____	ENTANGLED IN FLUTBAK?	YES	NO	LINK
STRAIGHT LINE		B. ASSOCIATED WITH FAUNA:				
CARPAPACE WIDTH		SPECIES	NUMBER			DISTANCE (m)
CURVED		1 _____	_____			
STRAIGHT LINE		2 _____	_____			
TAIL LENGTH		3 _____	_____			
CARPAPACE - TIP						

CLONCA (mm) - TIP PLASTRON - TIP HEAD WIDTH STRAIGHT LINE WEIGHT (kg)	TAGS: 1. TAGS PRESENT WHEN CAPTURED: YES NO LINK ☒ PLASTIC ☐ METAL ☐ TAG # 2. TAG(S) REMOVED: YES NO ☒ 3. TAGS APPLIED BY/OBSERVER: TAG # 4. TAGS APPLIED BY/OBSERVER: TAG # 5. TAGS APPLIED BY/OBSERVER: TAG #	SAMPLES COLLECTED? YES NO ☒
CLONCA (mm) - TIP PLASTRON - TIP HEAD WIDTH STRAIGHT LINE WEIGHT (kg)	TAGS: 1. TAGS PRESENT WHEN CAPTURED: YES NO LINK ☒ PLASTIC ☐ METAL ☐ TAG # 2. TAG(S) REMOVED: YES NO ☒ 3. TAGS APPLIED BY/OBSERVER: TAG # 4. TAGS APPLIED BY/OBSERVER: TAG # 5. TAGS APPLIED BY/OBSERVER: TAG #	SAMPLES COLLECTED? YES NO ☒

84

U.S. DEPT. OF COMMERCE

1404

N.W. k.		CRUISE #		RECORD		YR		MO		DAY		TIME		LATITUDE		LONGITUDE		EM	
11477066						92		11		21				0935N		098337E		0.2. P. 1	
SPECIES:		OLIVE RIDLEY		14		GREEN/BLACK								LEATHERBACK		"			
(check one)		HAWKSBILL		1		LOGGERHEAD		1		1		1		UNIDENTIFIED		1		1	

IDENTIFICATION: NUMBER OF: LEFT ORAL SCUTES <u>6</u> RIGHT ORAL SCUTES <u>6</u> VENTRAL SCUTES <u>1</u> INFRAMARGINAL SCUTES <u>4</u>	OVERLAPPING SCUTES? YES ☐ NO ☒ INFRAMARGINAL PORES? YES ☐ NO ☒ 1 PAIR INFRONTAL SCALY? YES ☐ NO ☒ LACRIMAL BONY SHELL? YES ☐ NO ☒ DORSAL COLORATION: ORANGE/RED ☐ GRAYISH ☒ UNUSUAL ☐	ASSOCIATED WITH PLOTS/AM OR OTHER FAUNA: YES ☐ NO ☒ A. ASSOCIATED WITH PLOTS/AM: DISTANCE: _____ m ENTANGLED IN PLOTS/AM? YES ☐ NO ☒ B. ASSOCIATED WITH FAUNA: SPECIES _____ NUMBER _____ DISTANCE (m) _____ 1 _____ 2 _____ 3 _____	TAGS: 1. TAGS PRESENT WHEN CAPTURED: YES ☐ NO ☒ PLASTIC ☐ METAL ☒ TAG # _____ TAG # _____ TAG # _____ ADDRESS: _____ 2. TAG(S) REMOVED: YES ☐ NO ☒ 3. TAG(S) APPLIED BY OBSERVER: _____ TAG # _____ TAG # _____ TAG # _____ <u>1603121216031213</u>	SAMPLES COLLECTED? YES ☐ NO ☒
DIMENSIONS (cm): CARAPACE LENGTH <u>6.6</u> CURVED <u>6.8</u> STRAIGHT LINE <u>7</u> CARAPACE WIDTH <u>3</u> CURVED <u>3</u> STRAIGHT LINE <u>3</u> TAIL LENGTH <u>1.5</u> CARAPACE TIP <u>1.5</u> CLOACA (WING) TIP <u>1.5</u> PLASTRON TIP <u>1.5</u> HEAD WIDTH <u>1.5</u> STRAIGHT LINE <u>1.5</u> WEIGHT (g) <u>1.5</u>	BEHAVIOR AT CAPTURE: 1) BASKING ☒ 2) HATHING ☐ 3) SWIMMING ☐ 4) FEEDING ☐ 5) OTHER (Describe) _____			

NOTES: Use back of form for notes on any abnormalities, diseases, epizoots, signs of shark attack, and the diagnostic characteristics observed when identifying specimens not brought aboard.

TAIL MEASUREMENTS CARPACE-TP DORSAL VENTRAL	PLASTRON-TP / VENT-TP VENT-TP PLASTRON-TP	CARPACE WIDTH CARPACE LIBERTY
ENVIRONMENTAL DATA AIR TEMP °C SEA SURF TEMP °C BLACK BULB ° NO DEPTH WEATHER CONDITION SUN OVERCAST RAIN/SHOWERS FOG CLOUD COVER	DORSAL VIEW DORSAL SCUTES APPEXIMATED SCUTES	SCUTES VENTRAL VIEW APPEXIMATED SCUTES APPEXIMATED SCUTES MORE THAN ONE PAIR PREFRONTAL SCUTES ONE PAIR PREFRONTAL SCUTES
Fishy - appeared to be quite bulky. At eye level appeared to be a crest would be to lip		
This and the 2 teeth were all separated by 4 mils or so		

SEA TURTLE LIFE HISTORY FORM

U.S. DEPT. OF COMMERCE

Buckley

COURSE # RECORD YEAR MO DAY TIME LATITUDE LONGITUDE BW

1477 067 92 11 21 0930 09.35N 09.842W

SPECIES: OLIVE RIDLEY ☒ HAWKSBILL ☐

GREEN/BLACK ☐ LEATHERBACK ☐
 LOGGERSHEAD ☐ UNIDENTIFIED ☐

IDENTIFICATION:

NUMBER OF LEFT COSTAL SCUTES 6
 RIGHT COSTAL SCUTES 6
 VENTRAL SCUTES 12
 INFRAMARGINAL SCUTES 19

OVERLAPPING SCUTES? YES ☐ NO ☒ UNK ☐
 INFRAMARGINAL PORE? YES ☒ NO ☐ UNK ☐
 1 PAIR PREFRONTAL SCUTES? YES ☒ NO ☐ UNK ☐
 LACKS BONY SHELL? YES ☒ NO ☐ UNK ☐
 DORSAL COLORATION: ORANGE/RED ☐ GRAYISH ☐ UNKNOWN ☐

DIMENSIONS (cm):

CARAPACE LENGTH CURVED 165.0
 STRAIGHT LINE
 CARAPACE WIDTH CURVED
 STRAIGHT LINE
 TAIL LENGTH
 CARAPACE - TP
 CLOACA (WING - TP)
 PLASTRON - TP
 HEAD WIDTH
 STRAIGHT LINE
 WEIGHT (kg)

ASSOCIATED WITH FLOTSAM OR OTHER FAUNA: YES ☐ NO ☒ UNK ☐
 A. ASSOCIATED WITH FLOTSAM: YES ☐ NO ☒ UNK ☐
 DISTANCE: _____ m EXTENDED IN FLOTSAM? ☐ YES ☒ NO ☐ UNK ☐

B. ASSOCIATED WITH FAUNA:
 SPECIES NUMBER DISTANCE (m)
 1
 2
 3

TAGS:

1. TAGS PRESENT WHEN CAPTURED: ☐ YES ☒ NO ☐ UNK ☐ PLASTIC ☐ METAL ☐

TAG #

ADDRESS:

2. TAG(S) REMOVED: YES ☐ NO ☒ UNK ☐

TAGS APPLIED BY OBSERVER:

TAG # TAG # TAG # TAG # TAG # TAG #

BEHAVIOR AT CAPTURE:

- 1) BASKING ☒
 2) MATING
 3) SWIMMING
 4) FEEDING
 5) OTHER (describe)

SAMPLES COLLECTED? YES ☐ NO ☒ UNK ☐

NOTES: Use back of form for notes on any abnormalities, diseases, epibiosis, signs of shark attack, and the diagnostic characteristics observed when identifying specimens not brought aboard.

TAIL MEASUREMENTS CARAPACE-TP	PLASTRON-TP / VENT-TP	CARAPACE WIDTH LENGTH
DORSAL VENTRAL	DORSAL VIEW VENTRAL VIEW	SCUTES VENTRAL VIEW
ENVIRONMENTAL DATA AIR TEMP °C SEA SURF TEMP °C WEATHER CONDITION BUN OVERCAST RAIN/SQUALLS FOG	ONE PAIR PREFRONTAL SCUTES MORE THAN ONE PAIR PREFRONTAL SCUTES	

hitting ♀. observer injury. 1.5 at night. Heavy close watches on specimen. apparently male had tried to mate but @ least once.

SEA TURTLE LIFE HISTORY FORM

R. L. P.
 U.S. DEPT. OF COMMERCE

CRUISE # 1477 RECORD 068 YEAR 92 MO 12 DAY 05 TIME 0950
 LATITUDE 072.1 LONGITUDE 110.891.0
 SPECIES: OLIVE RIDLEY ☒ LEATHERBACK ☐
 HAWKSBILL ☐ LOGGED/HEAD ☐ UNIDENTIFIED ☐

IDENTIFICATION: 27 oriental
 NUMBER OF LEFT COSTAL SCUTES 7 OVERLAPPING SCUTES? YES ☐ NO ☒ UNK ☐
 RIGHT COSTAL SCUTES 7 INFRA-MARGINAL POROSITY YES ☒ NO ☐ UNK ☐
 VENTRAL SCUTES 1 PAIR PREFRONTAL SCUTES YES ☒ NO ☐ UNK ☐
 INFRA-MARGINAL SCUTES 1 LACKS BONY SHELL YES ☒ NO ☐ UNK ☐
 DORSAL COLORATION: ORANGE/RED ☐ GRAYISH ☒ UNKNOWN ☐

DIMENSIONS (cm):
 CARAPACE LENGTH 10.7 10.0
 CURVED 10.5
 STRAIGHT LINE 10.5
 CARAPACE WIDTH 10.5
 CURVED 10.5
 STRAIGHT LINE 10.5
 TAIL LENGTH 10.5
 CARAPACE-TIP 10.5
 CLOACA (WING-TIP) 10.5
 PLASTRON-TIP 10.5
 HEAD WIDTH 10.5
 STRAIGHT LINE 10.5
 WEIGHT (kg) 10.5

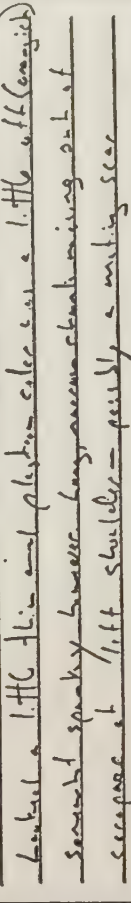
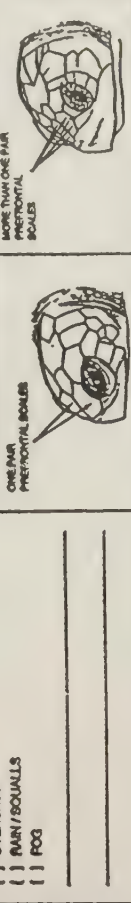
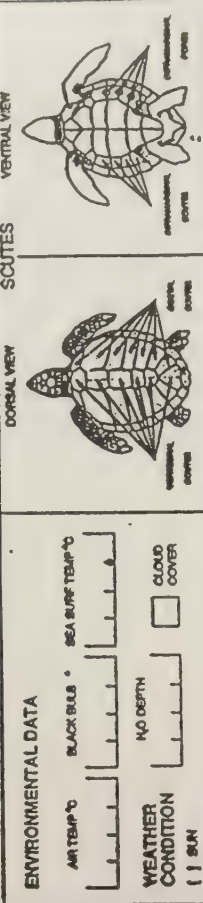
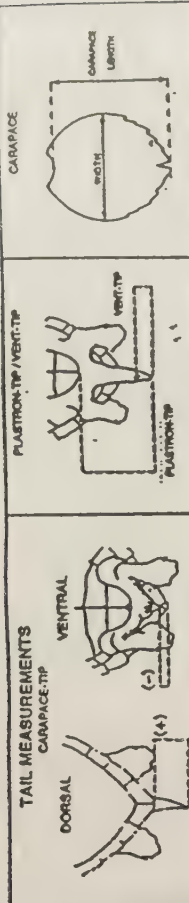
ASSOCIATED WITH FLOTAM OR OTHER FAUNA: YES ☐ NO ☒ UNK ☐
 A. ASSOCIATED WITH FLOTAM: YES ☐ NO ☒ UNK ☐
 DISTANCE: 1 m ENTANGLED IN FLOTAM? YES ☐ NO ☒ UNK ☐
 B. ASSOCIATED WITH FAUNA: YES ☐ NO ☒ UNK ☐
 SPECIES Red-footed Booby NUMBER 2 DISTANCE (m) 1 reaching
 1 Red-footed Booby
 2 Booby
 3 Booby

TAGS: YES ☐ NO ☒ UNK ☐ PLASTIC ☐ METAL ☐
 1. TAGS PRESENT WHEN CAPTURED: YES ☐ NO ☒ UNK ☐
 TAG # 160131312 TAG # 160131313 TAG # 160131314
 ADDRESS: Salt Lake City
 2. TAG(S) REMOVED: YES ☐ NO ☒ UNK ☐
 3. TAGS APPLIED BY OBSERVER: YES ☐ NO ☒ UNK ☐
 TAG # 160131312 TAG # 160131313 TAG # 160131314

BEHAVIOR AT CAPTURE:
 1. BASKING ☐
 2. MATING ☐
 3. SWIMMING ☐
 4. FEEDING ☐
 5. OTHER (describe) ☐

SAMPLES COLLECTED? YES ☐ NO ☒ UNK ☐

NOTES: Use back of form for notes on any abnormalities, diseases, epibionts, signs of shark attack, and the diagnostic characteristics observed when identifying specimens not brought aboard.



SEA TURTLE LIFE HISTORY FORM

R.L. Pritchard
U.S. DEPT. OF COMMERCE

Nick K.

COURSE # RECORD 11477070 921205 1020 TIME LATITUDE 0719N LONGITUDE 08904W

SPECIES: OLIVE RIDLEY (✓)
HAWKSBILL ()

GREEN/BLACK () LEATHERBACK ()
LOGGERHEAD () UNIDENTIFIED ()

IDENTIFICATION:
NUMBER OF: LEFT COSTAL SCUTES [5]
RIGHT COSTAL SCUTES [5]
VERTICAL SCUTES []
INFRA-MARGINAL SCUTES []

OVERLAPPING SCUTES YES () NO (✓) UNK ()
INFRA-MARGINAL PORES YES (✓) NO () UNK ()
1 PAIR PREFRONTAL SCUTES YES () NO (✓) UNK ()
LACIS BODY SHELL YES (✓) NO () UNK ()
DORSAL COLORATION: ORANGE/RED () GRAYISH () UNKNOWN ()

DIMENSIONS (cm):
CARAPACE LENGTH CURVED [28.1]
STRAIGHT LINE []
CARAPACE WIDTH CURVED []
STRAIGHT LINE []
TAIL LENGTH []
CARAPACE-TP [10.0]
CLOACA (mm)-TP []
PLASTRON-TP []
HEAD WIDTH []
STRAIGHT LINE []
WEIGHT (kg) []

ASSOCIATED WITH FLOTSAM OR OTHER FAUNA: YES () NO (✓) UNK ()
A. ASSOCIATED WITH FLOTSAM: YES () NO (✓) UNK ()
DISTANCE: [] m ENTANGLED IN FLOTSAM? YES () NO (✓) UNK ()
B. ASSOCIATED WITH FAUNA: YES () NO (✓) UNK ()
SPECIES [] NUMBER [] DISTANCE (m) []

TAGS:
1. TAGS PRESENT WHEN CAPTURED: YES () NO (✓) UNK ()
PLASTIC () METAL ()
TAG # []

ADDRESS: []
2. TAGS REMOVED: YES () NO (✓) UNK ()
TAG # []

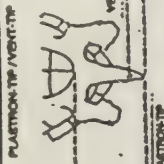
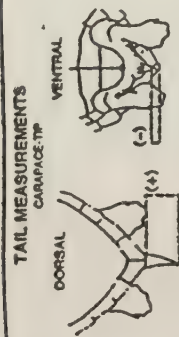
3. TAGS APPLIED BY OBSERVER: YES () NO (✓) UNK ()
TAG # []

SAMPLES COLLECTED? YES () NO (✓) UNK ()

BEHAVIOR AT CAPTURE:

- 1) BASKING []
2) MATING []
3) SWIMMING []
4) FEEDING []
5) OTHER (describe) []

NOTES: Use back of form for notes on any abnormalities, diseases, epibiosis, signs of shark attack, and the diagnostic characteristics observed when identifying specimens not brought aboard.



CARAPACE



ENVIRONMENTAL DATA

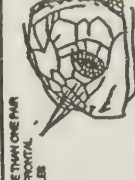
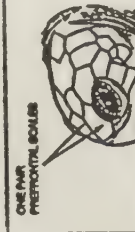
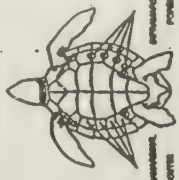
AIR TEMP °C [] BLACK BULB °C [] SEA SURF TEMP °C []
WEATHER CONDITION [] NO DEPTH [] CLOUD COVER []
[] SUN [] OVERCAST [] RAIN/SCALLS [] FOG []

SCUTES

DORSAL VIEW



VENTRAL VIEW



Ad. ♂ penis was fully protruded from tail tip during capture. Molt around 1 cent along carapace - sand color on plastron but animal was quite large enough not obviously emaciated. Chink missing out of trailing edge of scapular. There was a gap between 1st + 2nd scapulars.

Slipper pads on rt. side where they may have pulled up - Taylor had a high white ring - possibly a scar.

→ A sealed 77 liter container to 1.5 kg

SEA TURTLE LIFE HISTORY FORM

R.L.O. 16

U.S. DEPT. OF COMMERCE

K. K. K.

CRUISE #

RECORD

11477071

YEAR

MO

DAY

9.2.12

TIME

1045

LATITUDE

N

LONGITUDE

W

071.81108.859

SPECIES:
(check one)OLIVE RIDLEY ☒HAWKSBILL ☐GREEN/BLACK ☐LEATHERBACK ☐LOGGINGHEAD ☐UNIDENTIFIED ☐

IDENTIFICATION:

NUMBER OF: LEFT COSTAL SCUTES

6

RIGHT COSTAL SCUTES

6

VERTICAL SCUTES

1

INFRAVENTRAL SCUTES

1

OVERLAPPING SCUTES?

YES ☐ NO ☒

INFRAVENTRAL SCUTES?

YES ☒ NO ☐

PAIR PREVENTRAL SCUTES?

YES ☐ NO ☒

LACER BODY SHELL

YES ☒ NO ☐

DORSAL COLORATION: ORANGE/RED

YES ☐ NO ☒

ASSOCIATED WITH FLOTTAM OR OTHER FAUNA:

YES ☐ NO ☒

A. ASSOCIATED WITH FLOTTAM:

DISTANCE: _____

B. ASSOCIATED WITH FAUNA:

SPECIES _____

DIMENSIONS (cm):

CARAPACE LENGTH

64.1

STRAIGHT LINE

64.1

CARAPACE WIDTH

CURVED

STRAIGHT LINE

64.1

CARAPACE LENGTH

64.1

CARAPACE WIDTH

64.1

CARAPACE LENGTH

64.1

CARAPACE WIDTH

64.1

CARAPACE LENGTH

64.1

CARAPACE WIDTH

64.1

CARAPACE LENGTH

64.1

CARAPACE WIDTH

64.1

CARAPACE LENGTH

64.1

CARAPACE WIDTH

64.1

CARAPACE LENGTH

64.1

CARAPACE WIDTH

64.1

CARAPACE LENGTH

64.1

CARAPACE WIDTH

64.1

CARAPACE LENGTH

64.1

CARAPACE WIDTH

64.1

CARAPACE LENGTH

64.1

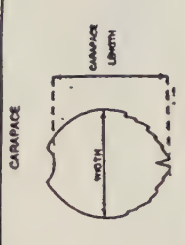
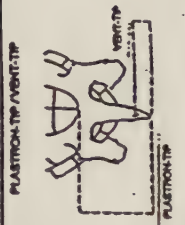
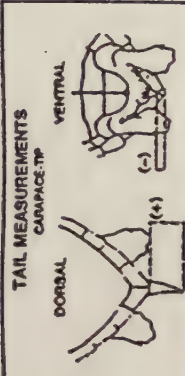
CARAPACE WIDTH

64.1

CARAPACE LENGTH

64.1

NOTES: Use back of form for notes on any abnormalities, diseases, epibiosis, signs of shark attack, and the diagnostic characteristics observed when identifying specimens not brought aboard.



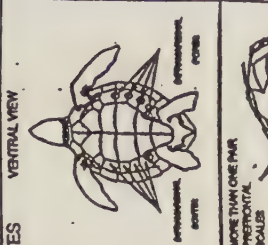
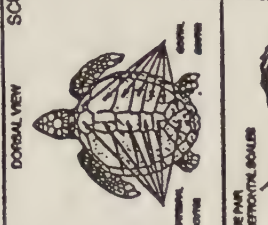
ENVIRONMENTAL DATA

AIR TEMP °C _____ SEA SURF TEMP °C _____

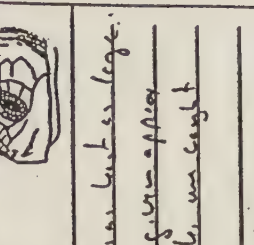
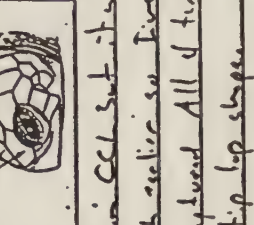
BLACK RAIN °C _____ NO DEPTH _____

WEATHER CONDITION _____ CLOUD COVER _____

() SUN () OVERCAST () RAIN/SCALLS () FOG



Adult ♂, yellow leatherback, but with good black & white epibiosis. Forget to write down CCL but it was as long as legs. as ♂ caught & measured 16 inches so I'm giving approx measure. Carapace deep in back captured. All of tail, was caught today seemed not to be in tip top shape.



TAGS:

1. TAGS PRESENT WHEN CAPTURED: YES ☐ NO ☒ PLASTIC ☐ METAL ☒

2. TAGS REMOVED: YES ☐ NO ☒

3. TAGS APPLIED BY OBSERVER: YES ☐ NO ☒

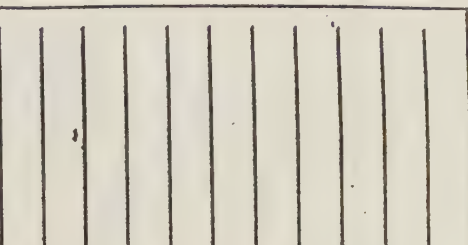
ADDRESS: _____

SCALES FROM PREVIOUS TAGS? YES ☐ NO ☒

TAG # _____

16033381603339

SAMPLES COLLECTED? YES ☐ NO ☒



APPENDIX V
LIST OF EQUIPMENT

RESEARCH EQUIPMENT SHIPPED FOR THE DOLPHIN-SAFE FROM SWFSC.

Research equipment shipped to Nicole K for Dolphin-Safe
Charter from SWFSC/IATTC:
Two eight-foot aluminum poles
Two eight-foot wooden poles
One ten-foot telescoping antenna mast
Five ten-foot sections of PVC pipe
Two 2-meter measuring sticks
Two stainless steel dipnet rings
Net webbing
Foot pump (for rafts - not necessary plenty of compressed air
available on ship)
Net twine
Large plastic garbage bags
Cable ties (stomach samples)
Small plastic bags
Calipers (for measuring sticks)
One twelve-foot inflatable raft and wooden floorboards
One large ice chest
Two canvas sections
Bunji cords
Coaxial cables
Power outlet
Twelve-volt power source
Four preamplifiers
Three fifty-foot lines
Tool kit
Field guide (fish and cetacean)
Two rolls of electrical tape
PVC connectors
Dissection kit: four knives, oil, box of surgical gloves
One external speaker
One hose clamp
Two headphone covers and eyeglass adapters
Three male BNC caps
Dust tape
Flashlight
Two hand counters
500 whirlpacks
Three boxes of large Ziplock bags
Clipboard with paper, pens, and pencils
Two H antennas
Two headphone sets
Compass
Labels
Twenty-four AAA batteries and 72 AA batteries
Electric air pump

**APPENDIX V
LIST OF EQUIPMENT**

RESEARCH EQUIPMENT SHIPPED FOR THE DOLPHIN-SAFE FROM SWFSC.

Whetstone
Four seventeen-foot Telonics cables
Radio tracking cables, including two 5-foot cables
Two telonics straps
Handheld radio and accessories
One Telonics radio transmitter (used to test equipment prior to tracking operations)
One cigarette lighter adapter and one dual adapter
Nine antennas (4 ATS, 5 Telonics)
Blankets, pillows, sheets
One pair of binoculars
One ring binder, tape measure, three hole punch, duct tape, fiber tape
One battery and case
Laptop computer (printer, and paper would have been useful for composing and sending FAX messages)
Video camcorder 8mm and underwater housing
Video tapes (VHS and HIGH8 format) 120 minute recording time
Two spare camcorder batteries (purchased by MMD)
Snorkel, mask, and fins for work inside net
Box of 3.5" computer diskettes
Assorted pens, pencils, and markers
Official Passport
Folders to organize field data
Greenbook to record field data
Fiber packing tape (at least two rolls)
Several NOAA labels to affix to boxes and gear in transit
Several pads of lined paper
2 Tuna catching nets (we retained this gear aboard the seiner in order to try and use them to catch tuna in the net after the McArthur departed. They proved to be unsuitable for catching tunas during backdown. They were left aboard the Nicole K because the shipping cost would have exceeded the cost of construction.

Useful Items For Future efforts

A 35 mm underwater camera and slide film
Full complement of turtle sampling gear including centrifuge to spin blood elements.
Comprehensive fish and shark keys.
Means of collecting and bringing back soft bodied invertebrates trapped in the net after backdown.
Cooler for transporting frozen fish specimens collected during backdown.

